

## ARCHIVES OF OTOTOLOGY.

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### PHYSIOLOGICAL INVESTIGATIONS OF NASAL RESPIRATION.

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(With II cuts.)

THE nose is the important portal through which the most indispensable of our victuals, the atmospheric air, has to take its entrance to the deeper parts of the respiratory organs.

When, for some reason or other, this respiratory channel is obstructed, various inconveniences and disorders soon appear. As far as they concern the distance between the nose and the larynx, they are well known; but a more exact analysis of the disturbances produced by mouth-breathing upon the pulmonary respiration and the general health, is still wanting.

The nose is, however, more than a mere place of transit for the respired air. The latter, in the condition in which it is present in the surrounding medium, is not fit to be absorbed as such in the blood. Its temperature commonly—at least in the cooler regions of the earth—varies too much from that of the body, the amount of water which it contains, in proportion to its temperature, is rather small, its purity is not always what it should be—and this even outside of the closed dwellings of man.

In all these respects, the nose has an influence on the inspired air, which is favorable to the respiratory function; but the nose has still other functions in regard to the respiratory organs. There are admixtures in the inspired air which are not changed by the mucous membrane of the

nasal cavities, and others which this membrane can eliminate from the rest of the respiratory tract only in the smallest quantities. Of great assistance in this respect are the sensibility on the one hand and olfactory function on the other. The olfactory sense announces to us that there is something uncommon or offensive, and therefore abnormal, in the respiratory air—it warns us.

In addition, the peculiar reflex actions of the nose begin in the ramifications of the trigeminus; and these may certainly be regarded as protective to the respiratory organs.

### I.

The study of nasal respiration is one of the chapters of human physiology which has been investigated the least. We hardly find any thing about it in the hand-books and text-books on physiology. We search in vain for this information in the great works of Hermann, in the extensive works of Funke-Grünhagen, of Valentin, and in the "Physiology of Respiration," by Vierordt; and when we look for original articles in literature, we find but very little of importance.

Gréhant<sup>1</sup> mentions in his chapter on respiration, that when, with an outside temperature of 22° C. (71.6° F.) and a body temperature of 36.7° C. (98° F.), seventeen respirations are performed in a minute, the expired air, with *inspiration through the nose* and expiration through the mouth against the thermometer, showed a temperature of from 34.5° C. (94.1° F.) to 35.5° C. (95.9° F.), on an average 35.3° C. (95.5° F.). When, however, both inspiration and expiration took place through the mouth, the thermometer only rose to 33.9° C. (93° F.). It appears from this that when the air is inspired through the nose, its temperature upon expiration is higher than when it is inspired through the mouth, 1.5° C. (2.7° F.).

The only persons who have written on the physiology of nasal respiration are the rhinologists; and yet most of them

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<sup>1</sup> "Recherches physiques sur la respiration de l'homme." Par Nestor Gréhant, Paris, 1864.

give only a summary account of the advantages of nasal respiration.<sup>1</sup>

Special experiments on the respiratory action of the nose are to be found for the first time by the Nestor of present laryngology, Morell Mackenzie.<sup>2</sup> Mackenzie expired into an india-rubber bag of a capacity of four litres, to one end of which a thermometer was fixed, while the other end was connected with the mouth by an india-rubber tube. *He found the temperature of the expired air. 0.9° C. (1.5° F.) higher by nasal than by oral inspiration.* This result shows, in comparison with those of all other experimenters, too low a figure, and is doubtless wrong. The error can be explained by the neglect of warming, or at least an insufficient warming of the bag preceding the experiment.

Afterward Mackenzie changed his experiment in such a way, that the bulb of the thermometer was placed in the pharynx of a person. When the thermometer stood at 32.3° C. (90.1° F.), slow inspiration was taken, and the thermometer fell to 32° C. (89.6° F.); it fell to 31.4° C. (88.5° F.) when the inspiration was taken with open mouth. It appears from this experiment, that when the air reaches the lungs after passing through the relatively long and narrow nasal passage, it will have a higher temperature than when it has passed through the mouth. But these experiments do not take into account the influence of the rapidity of the current of air, the depth and frequency of the respirations, nor the sensibility of the instrument, etc.

Mackenzie also lays great stress on the purifying and moistening action of the nasal cavities, but without any experiments on these points.

An important treatise is that of E. Paulsen<sup>3</sup> on the "Direction of the Air-Current in the Nose," made under the

<sup>1</sup> "Hand-Book of the Diagnosis and Treatment of Diseases of the Throat, Nose, and Naso-Pharynx," by Carl Seiler, M.D. Second edition. Philadelphia, 1883.

<sup>2</sup> "Die Krankheiten des Halses und der Nase," von Morell Mackenzie. Deutsche Bearbeitung von F. Semon. Bd. ii., Berlin, 1884, S. 515 u. 516.

<sup>3</sup> Experimentelle Untersuchungen über die Strömung der Luft in der Nasenhöhle. Von Dr. Ed. Paulsen aus Kiel. *Sitzungsber. d. k. Akad. d. Wissensch.*, Bd. lxxv., April 10, 1882.

guidance of Sigmund Exner. Paulsen used the heads of cadavers preserved in alcohol; these were split in sagittal section passing through the septum of the nose, so that it was just possible to attach small pieces of red litmus-paper to different parts of the nasal cavities. After putting the two halves together again, air mixed with ammonia was forced through the cavities. From the greater or lesser amount of blue-coloring of the paper a conclusion was arrived at concerning the strength of the air-current. "The strongest blue-coloring took place on the septum, beginning in the neighborhood of the nostrils, extending upward at the dorsum nasi, along the upper part of the septum and the roof of the nasal cavity, then backward and downward in a semicircular direction." The posterior part of the inferior meatus was colored relatively stronger than the anterior portion, the middle meatus being but slightly affected.

Paulsen concludes, as a result of his experiments, that the inspiratory air-current, after entering the horizontally placed nostrils, *flows principally along the septum backwards to the lower parts of the posterior nares.*

*The direction of the expiratory air-current was found to be the same.* No coloring was found in the accessory cavities of the nose with the ordinary above-mentioned experiments, but *when the air-currents acted intermittently, like the natural respirations, a strong coloring took place.*

The first and, as far as I am able to see from literature, the only one that has made an extensive investigation of the respiratory functions of the nose, is Th. Aschenbrandt.<sup>1</sup> By means of simply physical experiments, he tried to investigate:

1. The amount of increase of temperature of the inspiratory air in the nasal cavity.
2. The amount of moisture it takes up.
3. The degree of purification from suspended contaminations in the inspired air effected in the nose.

Experiments in which five litres of air were drawn by means of a flask aspirator through the nose in thirty

<sup>1</sup> "Die Bedeutung der Nase für die Athmung." Von Dr. med. Th. Aschenbrandt. Würzburg, 1886.



seconds showed that the air, with an outside temperature of  $8^{\circ}\text{C}$ . ( $46.8^{\circ}\text{F}$ .) and with one of  $12^{\circ}\text{C}$ . ( $53.6^{\circ}\text{F}$ .) is heated in the nasal cavity alone to from  $30.1^{\circ}\text{C}$ . ( $86.1^{\circ}\text{F}$ .) to  $30.2^{\circ}\text{C}$ . ( $86.3^{\circ}\text{F}$ .) on an average; that differences of a few degrees in the temperature of the outside air do not affect the degree of heating in the nose; and that the heating in one nasal cavity is exactly the same as when the air has passed through both cavities.

Aschenbrandt also concludes from his experiments that neither larynx, trachea, nor the lungs give heat to the air.

Investigations regarding the second point in question showed that *the respiratory air is completely saturated with moisture in the nose, the degree depending upon the temperature of the air*, and that therefore the nose produces all the expiratory watery vapor.

In regard to the retention of dust, Aschenbrandt found that very fine impurities of the air—chemical dust,—for instance, chloride of ammonium, are kept back only slightly or not at all, while larger dust-particles do not pass through the nose, at least do not go beyond the pharynx.

Aschenbrandt draws the following conclusions:

1. The inspiratory air is heated only to  $30^{\circ}\text{C}$ . ( $86^{\circ}\text{F}$ .) on its way through the nose. Whether the air inspired be somewhat warmer or colder, has no influence upon this result under normal circumstances.

2. The supposition that the lungs give water to the inspired air in an important degree, as accepted by many authors, is erroneous. The air has already been saturated with moisture in the nose, the degree depending upon the temperature of the air.

3. Finer chemical dust and gases are not kept back by the nose. Larger dust-particles do not reach the deeper respiratory organs; the latter are, however, not only kept back by the nose, but the naso-pharynx is also of considerable importance in this matter.

The important results of these experiments are, however, limited in value, since the methods by which they were obtained are questionable; the results cannot, therefore, be accepted without renewed research. The importance of

the subject and its scientific interest caused me to undertake this. I was permitted to conduct my investigations of these, and of other points of which I shall speak later, in the laboratory of the Physiological Institute (Freiburg); and I am glad to have an opportunity of expressing my thanks to Prof. v. Kries for his kind interest in my work.

## II.

### DETERMINATION OF THE TEMPERATURE OF THE AIR PASSING THROUGH THE NOSE.

Imitating the natural process during respiration, we should determine the temperature of the air which has passed once through one nasal cavity, in the direction from nostril to pharynx, or the reverse; for it has been asserted that the heating is the same in both ways; this claim was established as the result of the above-mentioned investigations of Paulsen.

However, experiments have taught me that such a direct determination is impossible, and, therefore, *we must be satisfied with determining the temperature of the inspired air after it has passed through both nasal cavities.* To avoid the objection of measuring the temperature of a mixture of aspirated and expired air, I first tried to investigate the temperature in the same manner as Aschenbrandt did, viz., measuring the temperature of the aspirated air during a *respiratory pause*, after a prolonged deep inspiration; except that this does not put aside the objection that then the air is aspirated from the trachea. We can only be sure not to aspirate the expiratory air when we cause the inspiratory air to flow through the nasal cavities while the person inhales through the mouth or, better, through the nose. Then an air-current enters into the nasal cavity (for instance, the right one) and comes into the lungs; another current goes away from the principal current into the naso-pharynx and comes by force of the aspiration of the apparatus through the other nasal cavity into the tube which is connected with the aspiration apparatus. The temperature can thus be measured with a thermometer fixed air-tight into the tube with its bulb towards the air-current.

*A.—Experiments with the Thermometer.*

A single inspiration is sufficient to get a valuable result. Accidental errors are neutralized by a great many observations. The apparatus, the tube which is attached to the nostril, and the tube which contains the thermometer, must be dried well, or else the moisture of the aspirated air will adhere to the walls of the tubes, and the numbers obtained will be too high; this is explained by the liberation of heat through condensation of watery vapor.

The rapidity of the air-current influences the result; the more quickly the air leaves the warm space of the nose, the less heat it can take up; in a prolonged inspiration, with decreased rapidity at the end, the heating of the air is favored.

*The quantity of water taken up by the inspiratory air is, therefore, cæteris paribus, in inverse proportion to its rapidity.* It is, however, not likely that as regards to time practically consumed the rapidity will be of great influence.

In addition, *the temperature of the outside air which we inhale has a certain influence upon the amount of heat taken up in the nose.*

During my investigations I put aside the inconvenient apparatus of Aschenbrandt, my objection to it being that there was too great a rapidity of the air-current. Since it was necessary to exclude the influence of the heat of the expired air, and since the measurements must be taken during a single inspiration, I constructed the following simple apparatus:

A glass tube, *N*, 11 cm long and 1 cm wide, containing a thermometer through a short lateral branch (its bulb a distance of about 3 cm from the opening), is put tightly into the left nostril. The free end of the india rubber tube *M*, connected to the further end of the glass tube, is taken into the mouth. At an inspiration through the india-rubber tube, the air must take the following channel—through the right nostril, into the right nasal cavity, into the nasopharynx, from here into the left nasal cavity, into the glass tube, the india-rubber tube, into the mouth, and finally into the lungs. By this method the expiratory air can never come in contact with the thermometer.

In this simple manner I could measure temperatures at an outside temperature of  $-8^{\circ}\text{C}.$ ; with this method or with the other apparatus, I have taken a great many measurements at a temperature of  $18^{\circ}\text{C}.$  in the room. With a temperature of the inspired air of  $-8^{\circ}\text{C}.$  in the relatively few experiments the thermometer in my apparatus rose constantly to  $24.5^{\circ}\text{C}.$  and only at a prolonged (slow) inspiration to  $25.0^{\circ}\text{C}.$



FIG. 1.

At an outside temperature of  $-0.5^{\circ}\text{C}.$  with the Aschenbrandt apparatus, the thermometer generally rose, with forced inspiration, to  $26.3^{\circ}\text{C}.$

The following numbers were obtained from a larger number of measurements at an outside temperature of  $3.5^{\circ}\text{C}.$ :

$26.5^{\circ}$		$25.5^{\circ}$
$26.5^{\circ}$		$26.5^{\circ}$
$25.3^{\circ}$		$26.2^{\circ}$
$25.3^{\circ}$		$26.5^{\circ}$
$25.6^{\circ}$		$26.0^{\circ}$ average,

and the same number was obtained when the average of the most exact 26 of 39 measurements was taken. I omitted those taken at the beginning of the experiment in which

the thermometer was still too much heated and therefore had not fallen to the point at which it usually stood at the end of aspiration; and, on the other hand, I also excluded the results of those trials in which just the reverse had happened.

At an outside temperature of  $12^{\circ}$  C., the thermometer rose, in the experiment with aspiration by the simple apparatus, often to  $30.2^{\circ}$  C. (The temperature of the blood at the same time was  $37.1^{\circ}$ .)

At an outside temperature of  $18^{\circ}$  C. I obtained an average of a series of experiments of  $31.1^{\circ}$  C.

But the single measurements often differ very much one from another by one or more degrees; therefore I tried to measure the temperature of the air which passed the nasal cavities in still another manner.

*B.—Experiments by means of determining the Air-Pressure.*

When air of a certain temperature is allowed to enter a glass balloon with thin walls, under ordinary atmospheric pressure, the enclosed quantity of air will occupy a smaller space—its pressure will decrease—when the balloon is cooled. If, for instance, the balloon is brought into a waterbath of lower temperature than the enclosed air. On the contrary, the air in the balloon will possess an increased pressure, if the balloon is surrounded by a medium of higher temperature.

If the balloon be connected with a Marey's registering apparatus<sup>1</sup> (tambour à levier), the pencil of the apparatus will rise at an increase and will fall at a decrease of the temperature of the air in the balloon, and will remain in its original position when the temperature of the enclosed and of the surrounding air remains the same.

But the air gives up heat to the balloon as long as the latter is colder, and therefore a proper heating of the balloon before the experiment began was necessary. This seemed best accomplished by bringing the balloon into a water-bath, as experiments had shown me that it took the temperature

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<sup>1</sup> Comp. "Physiologie expérimentale." Travaux du Laboratoire de M. Marey, Année 1875. Paris, 1876. P. 123. La méthode graphique dans les sciences expérimentales, especially p. 129, foot-note.

of the water very rapidly. The method of experimenting was as follows :

The oblong balloon of glass is connected on each side, with glass-tubes containing glass stop-cocks ; these tubes extend somewhat into the balloon. By this arrangement the air-current passes everywhere through the balloon, and the formation of a single axial current is prevented. To stop-cock *A* there is fastened a glass-tube connected with a short india-rubber covered tube, intended for insertion into the left nostril. The other end of the balloon is connected with the tambour, and can be shut off at *D* by means of a clamp.

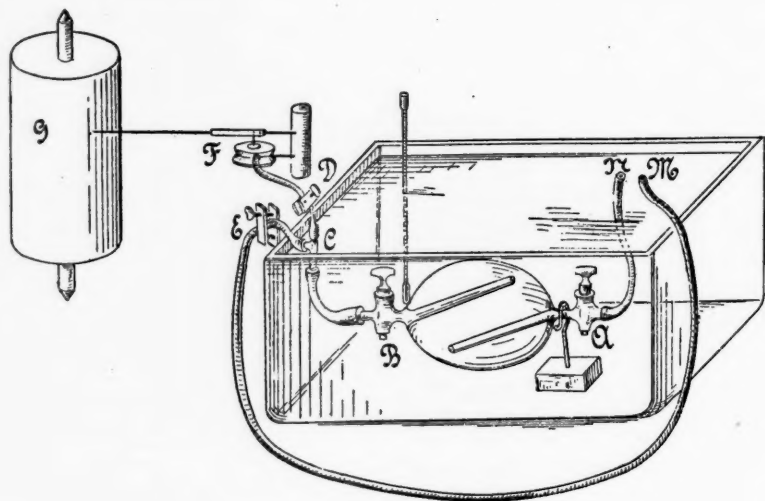


FIG. 2.

Between stop-cocks *B* and *D* there is a short T-shaped tube *C*, the free arm of which can be connected with the mouth by means of the long india-rubber tube *EM*, which also can be closed by a stop-cock. The pencil of the tambour *F* writes on the turning cylinder *G*. The balloon, held down by a weight, lies in the water-bath, so that the end of the tube *AN* only leaves the water directly in front of the nose ; the other tube emerges from the water at *C*.

After the apparatus has been in the bath of a certain temperature for some time, stop-cock *D* leading to the tambour is closed, and stop-cock *E* of the aspiration-tube is



opened. The glass stop-cocks *A* and *B* are also opened at this time. Now an inspiration is taken through the apparatus. The current of air again passes from the right into the left nasal cavity, thence through the balloon, and through *B*, *C*, *E*, *M* to the mouth and lungs. During inspiration, stop-cock *B* is closed first, and immediately afterwards *A*. In this manner the air enclosed in the balloon has a pressure corresponding to the temperature at which it enters. Now stop-cock *D* is opened, and the tambour being also under atmospheric pressure since it is in communication with the air in the room by the open tube *EM*, the cylinder is revolved a little, and the pencil marks a horizontal line, indicating that the pressures are equal. Then stop-cock *E* is closed, and *D* opened. Now the tambour is in communication with the air in the balloon instead of with the outside air. The temperature of the water-bath before the experiment begins must not differ too much from the temperature expected; and this must now be regulated by adding hot or cold water to it until the pencil of the tambour has returned to the *abscissa* of the atmospheric pressure. Then the thermometer in the water-bath shows the temperature of the air upon entering the balloon.

This corresponds to the *temperature to which the inspiratory air was heated in the nasal cavities*.

*a.* The temperature of the water-bath was kept at 30° C. for some little time. The result of this experiment was an apparent temperature of the air inspired through the nasal cavities of 29.7° C.

*b.* Temperature of the water-bath . . . 29.0° C.

Adjustment of atmospheric pressure at 29.0° C.

*c.* Temperature of the water-bath . . . 28.0° C.

Adjustment of the pencil of the tambour at 28.2° C.

This experiment showed that the temperature of the air in the balloon was higher than 28.2° C., that it had given heat to the colder wall of the balloon, and especially to the water which surrounded it.

*d.* Temperature of the water-bath . . . 27.0° C.

Adjustment of the tambour . . . 27.6° C.

The air has given up still more heat to the balloon, cooling it off still more.

<i>e.</i> Temperature of the water-bath	. . . . .	29.0° C.
Adjustment	. . . . .	29.2° C.
<i>f.</i> Temperature of the water-bath	. . . . .	29.5° C.
Adjustment	. . . . .	29.6° C.
<i>g.</i> Temperature of the water-bath	. . . . .	30.0° C.
Adjustment	. . . . .	30.1° C.

This shows that the temperature of the air passed through the nasal cavities is higher than that of the wall of the balloon, which still receives heat from it. The result is, therefore, not yet correct.

*h.* The water-bath is brought to 30.5° C., the tambour fixed at 30.3° C. Now the air passing through the balloon does not lose additional heat,—its temperature is lower than 30.5° C., higher than 30.3° C.

*i.* When the water-bath is kept at 30.3° C. then the indication of the pencil is at 30.3° also, and thus *the temperature of the air entering the balloon is measured.*

The temperature of the body at the time of the experiment was 37.3° C., that of the room had risen during the experiment to 16.5° C.

*Repetition of the Procedure with Balloon and Tambour.*

The next day I repeated such a series of measurements with the following results:

<i>a.</i> Temperature of the water bath	. . . . .	32.0°–31.0° C.
“ of the tambour	. . . . .	30.6° C.
<i>b.</i> Temperature of the water-bath	. . . . .	30.0° C.
“ of the tambour	. . . . .	29.8° C.
<i>c.</i> Temperature of the water-bath	. . . . .	29.3° C.
“ of the tambour	. . . . .	29.7° C.
<i>d.</i> Temperature of the water-bath	. . . . .	29.5° C.
“ of the tambour	. . . . .	29.7° C.

At an outside temperature of 13° C. and with a bodily temperature of 37° C. this series of experiments shows a heating of the inspired air in both nasal cavities to 29.7° C. In order to test the accuracy of these experiments, a series of experiments with the thermometer performed according

to the first method was made directly afterwards. The thermometer showed temperatures of

29.7° C.,  
29.5° C.,  
30.0° C.,

an average of . . . 29.73° C.,

thus exactly agreeing with the measurements found with the balloon.

Now for the sake of comparison, two experiments with aspiration according to the method of Aschenbrandt were made. Five litres of air were aspirated through the nose. The temperatures were 30.5° C. and 30.6° C., thus almost one degree higher than with the other experiments. This increase must be attributed to the additional heat of the expiratory air. One can observe in the mirror in which the height of the thermometer is seen, that the column of mercury rises at every expiration.

We have seen that air of 8°C. is heated in the nasal cavities to 24.5° C., an increase of some 15.5° C.

That air of from 0.5 to 3° C. is heated to 26° C., thus 24° C.

" " " " 12 " 16° C. " " " 30° C., " 16° C.

" " " " 18° C. " " " 31° C., " 13° C.

Thus the lower the temperature of the inspired air, the more heat is taken up by it in the nasal cavities.

*The amount of heating of the inspired air increases with the difference between its temperature and that of the body.*

No.	1 Temperature of the inspired air.	2 The difference between this and the tem- perature of the body (37°).	3 Heating in the nasal cavities to	4 Hence heating of the inspired air of	5 The propor- tion between 2 and 4 is about as
1	-8°	45°	24°	32°	3 to 2
2	-0.5-3° = 2°	35°	26°	24°	3 " 2
3	12° - 16° = 14°	23°	30°	16°	3 " 2
4	18°	19°	31°	13°	3 " 2

It appears from this table, that within the limits of my series of observations, the *proportion between this difference and the heating action of the nasal cavities is constant*, and can be expressed with great exactness by the formula :

$$E : D = 13 : 19$$

in which  $E$  is the heating of the inspiratory air in the nasal cavities, and  $D$  is  $37^\circ - t$  (the outside temperature).

With sufficient exactness we may say that

$$E : D = 2 : 3 \text{ or } E = \frac{2}{3} D, \text{ or } E = \frac{2}{3} (37 - t).$$

If we express the final temperature which the air has after having passed through the nasal cavities by  $t_1$ , then

$$t_1 = t + \frac{2}{3} (37 - t).$$

The more exact proportion holds good for Nos. 2, 3, and 4 of the above tables; whether it apply to observations of such low outside temperatures as in No. 1, or in progressive series, I do not know.

From these formulas, it is easy to ascertain the temperature which the inspired air gets in the nasal cavities, the temperature of the outside air being known.

On January 4, 1888, I took some measurements of temperature with the mouth-aspiration apparatus (fig. 1) in a patient of eighteen suffering with atrophic rhinitis. The temperature in the room was  $20^\circ \text{C.}$ , and instead of the expected  $31.3^\circ \text{C.}$  (according to the formula), I found a temperature of  $29.7^\circ \text{C.}$  The diminution in heating must have been dependent upon the greater dimensions and the dry condition of the nasal cavities.

*Schematic Experiments for Determining the Heating of  
the Air Passing through One Nasal Cavity.*

We do not properly appreciate the action of the nose as a heating space for the inspiratory air, as long as we have not determined the heating in the nasal cavity of one side separately. I have already shown that this cannot be done in a direct manner. Therefore I tried to accomplish it by means of schematic experiments. Let us imagine the whole mucous membrane of one nasal cavity placed in the shape of a tube next to the other, and long enough, when its walls have a temperature of  $37^\circ$ , to raise the temperature of air flowing through it with a certain rapidity to  $a + n$ , of which  $a$  is the beginning temperature, and  $n$  its increase in the tube. When the length of this tube  $= L$ , the inspiratory air has traversed a distance equal to  $2 L$  in our experi-

ments. It can thus be determined in what proportion the heating in  $L$ , that is the first half of  $2L$ , stands to that in  $2L$ . The following method was used (fig. 3):

Through a glass tube, 3.5 *cm* in diameter, having a short lateral tube connected with it near each end, water of a certain temperature and rapidity is conducted. Both ends of the tube are closed with corks, through which a second glass tube 1.2 *cm* in diameter, made of glass 0.1 *cm* thick, is placed so as to extend somewhat beyond the ends of the larger tube. It is the ordinary cooling apparatus used

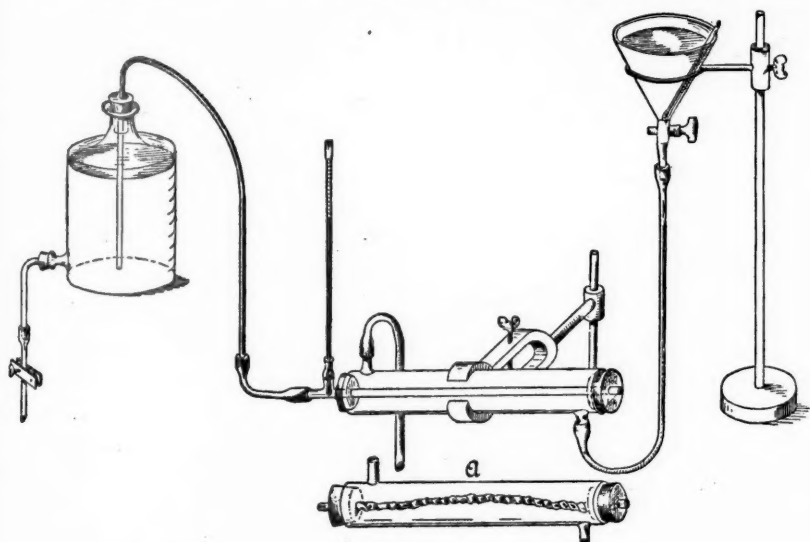


FIG. 3.

for the opposite purpose. To one end of the inner tube is connected a small T-shaped tube, by means of a short india-rubber tube; the other end of the horizontal arm of this T tube is connected with the aspiration-apparatus by means of an india-rubber tube. A thermometer is fixed air-tight in the vertical arm. Warm water is conducted through a funnel into the outer tube, a glass stop-cock regulating the flow. When the temperature of the water which enters the outer tube and that which leaves it is the same, the aspirations-apparatus is opened, and five litres of air are aspirated through the apparatus.

This is done once with a length of  $L$ , and then with a length of  $2L$ .

10.46.	The thermometer falls from	26.0°	to	25.8°
10.49.	“ “ rises “	25.5°	“	25.6°
10.51.	“ “ “ “	25.6°	“	25.8°
10.55.	“ “ remains at	25.8°	—	25.8°
10.59.	“ “ “	25.8°	—	25.8°
				<u>25.8°</u>



II. Instead of an apparatus with a length of  $L$ , one of  $2L$  is used ( $= 42\text{ cm}$ , circumference of the inner tube as in I., length of the outer tube,  $46\text{ cm}$ ).

A. Temperature of the outer tube,  $30.0^\circ$ .

Difference between the temperature of the water which enters and that which escapes, is about  $1^\circ$ .

Beginning 11.05 o'clock :

11.17.	The thermometer falls from	$24.8^\circ$	to	$24.4^\circ$
11.20.	" " " "	$24.5^\circ$	"	$24.2^\circ$
11.23.	" " " "	$24.0^\circ$	"	$23.8^\circ$
11.27.	" " rises "	$23.1^\circ$	"	$23.5^\circ$
11.34.	" " " "	$23.4^\circ$	"	$23.6^\circ$
11.37.	" " remains at	$23.7^\circ$	—	$23.7^\circ$
11.39.	" " " "	$23.7^\circ$	—	$23.7^\circ$
<hr/>				
$= 23.7^\circ$				

B. Temperature of the outside tube,  $35.0^\circ$ .

Temperature of the water entering,  $36.0^\circ$ , of that escaping,  $34.0^\circ$ .

11.58.	The thermometer rises from	$25.0^\circ$	to	$25.2^\circ$
12.—.	" " " "	$25.4^\circ$	"	$25.6^\circ$
12.02.	" " falls "	$25.9^\circ$	"	$25.8^\circ$
12.05.	" " rises "	$25.6^\circ$	"	$25.7^\circ$
<hr/>				
$= 25.7^\circ$				

C. Temperature of the outside tube,  $40.0^\circ$ .

Temperature of the water entering, about  $41^\circ$ , of that escaping, about  $39^\circ$ .

12.19.	The thermometer rises from	$26.5^\circ$	to	$27.2^\circ$
12.22.	" " " "	$26.8^\circ$	"	$27.5^\circ$
12.26.	" " " "	$27.4^\circ$	"	$27.5^\circ$
12.30.	" " " "	$27.5^\circ$	"	$27.6^\circ$
12.33.	" " remains at	$27.5^\circ$	—	$27.5^\circ$
12.36.	" " " "	$27.6^\circ$	—	$27.5^\circ$
<hr/>				
$= 25.7^\circ$				

The small differences of tenths are explained by the slight variations in the temperature of the water which is poured into the funnel.

*Tabular Statement of the Results of the Preceding Schematic Experiments.*

1	2	3	4	5	6	7	8
Length of tube.	Temperature in the outside tube.	Beginning (room) temperature.	Average temperature.	Increase of the beginning temperatures.	End temperature (heating).	Difference between 4 and 2.	Increase of this difference with a rise of 2 for every 5°.
L.	30°	19.5°	21.0°	3.0°	22.5°	9.0°	4.1
	35°	19.5°	21.0°	4.8°	24.3°	13.1°	4.2
	40°	19.5°	22.6°	6.3°	25.8°	17.3°	
2 L.	30°	19.5°	21.6°	4.2°	23.7°	8.4°	4.0
	35°	19.5°	22.6°	6.2°	25.7°	12.4°	4.1
	40°	19.5°	23.5°	8.0°	27.5°	16.5°	

If now we try to insert the corresponding numbers for the body temperature of 37°, then, in the first place, columns 1, 2, 3, and 8 are given. Since the differences between cols. 4 and 2 are 4.2, and 4.1 respectively, for every 5°, we can place in col. 8, for L, 1.7, and for 2 L, 1.6, for 37°. When we add these numbers in col. 7, to 13.1° and 12.4° (at 2 L), then it is possible, col. 2 being known, to determine the average temperatures, and from these and the known beginning temperatures (col. 3) to arrive at the final temperatures.

In this way we obtain the following supplement to the above tables:

1	2	3	4	5	6	7	8
L.	37.0°	19.5°	22.2°	5.4°	24.9°	14.8°	—
2 L.	37.0°	19.5°	23.0°	7.0°	26.5°	14.0°	—

If, now, we are allowed to transfer these schematic experiments to the conditions of the human nose, we should first find, from the formula

$$E = \frac{2}{3} (37 - t),$$

an increase of temperature in both nasal cavities to 31.1°, at an outside temperature of 19.5°, — a rise of 11.6°; and then we can obtain the heating in L, in one nasal cavity, from the equation

$$7 : 5.4 = 11.6 : x, \text{ namely } = 8.9°.$$

From this it results that the inspiratory air during its natural passage through the nose is heated from 19.5° to 28.4°, and the proportion of the actual heating to that found by experiments in both nasal cavities is about = 3 : 4.

Hence the air would only be heated  $\frac{37-1}{2}$

In this calculation, it is presupposed that the conditions of the experiment are analogous to those existing in the human nose; this is not exactly so. In the first place, the routes or, better, the surfaces, and secondly, the conditions of these surfaces, are not the same; for were this the case, the beginning temperature of  $19.5^{\circ}$  ought to rise to  $31.1^{\circ}$ ,

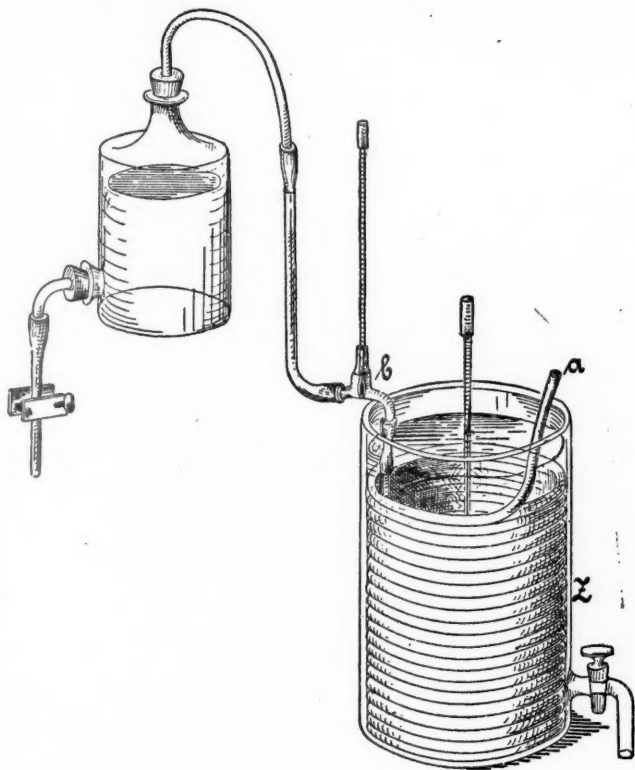


FIG. 4.

with an aspiration through the nasal cavities, while it really only reaches a temperature of  $26.5^{\circ}$ .

Therefore, I next enlarged the extent of surface, the rapidity of the air-current remaining the same.

A thin spiral tube of copper  $0.5\text{ cm}$  in diameter and  $4.16$  metres long was put into a water-bath at  $37^{\circ}$ . The one end of the tube was connected with a thermometer and with the aspiration-apparatus (fig. 4). When this is put into ac-

tion, the air flows into the coil at *a*, and through this into the bottle, passing the bulb of the thermometer at *b*. The vessel *z*, provided with a stop-cock, is filled to the brim with warm water, the temperature of which is constantly verified by a thermometer.

The experiments were performed with a tube of the above-mentioned length, and with one of half this length. Let us call the first *L*, the second one *2 L*.

*A.* Experiments with *L* ( $= 2.08$  metres). Rapidity as before ( $= 1$  litre in 5 seconds).

After the measurements had been continued for an hour, a heating to  $32.7^{\circ}$  is found, at a room-temperature of  $18.5^{\circ}$ , thus a difference of  $18.5^{\circ}$  as compared with the temperature of the mantle, and a rise of the beginning temperature of  $14.2^{\circ}$ .

*B.* Experiments with *2 L* ( $= 4.16$  metres). Rapidity as in *A*.

At a room-temperature of  $19^{\circ}$  the thermometer finally remains at  $33.7^{\circ}$ . At a difference of  $18^{\circ}$  between the beginning and the mantle temperatures, there is thus a rise of  $14.7^{\circ}$ .

It appears, therefore, that with the considerable length of tube of 2.08 and 4.16 metres, the differences in the heating of the passing air become insignificant. It is obvious that this is not only dependent upon the length, but even more upon the diameter, of the tube. In the two last-mentioned arrangements the surface heating the air which passes over it is five times as great as in the former arrangements; each particle of air has been in contact with the surface which gives the heat to it, five times as long.

But even this apparently enormous extent of surface is not as potent as the nasal mucous membrane. The passing air really receives a somewhat higher temperature; but the total heat-action of the nose for the evaporation of water does not come into consideration here.

Other factors of importance have to be taken into consideration with respect to the nasal cavities; the character of the surface of the mucous membrane and the size of the sinuses, the former always moist, the latter

of very irregular shape. Between septum and meatus the space is relatively large; between this and the turbinated bones it narrows in part, so that they almost touch each other. The air must take a winding course not exactly determined yet, though, according to Paulsen, the principal part of it passes along the septum. So we cannot imitate the exact conditions of the nose in these schematic experiments, even leaving out of consideration the enormous difference in length between the copper tube and the dimensions of the nose; but still we should try to arrange our experiments so as to come still nearer to the peculiarities of the nasal cavities.

A piece, 21 *cm* long (was put similarly to the first-mentioned schematic experiments), of the intestines of a sheep around a brass wire spiral, the windings of which were distant 1 *cm* from each other (fig. 3A). This membranous cylinder was connected at each end with a short glass tube of about 1.1 *cm* in diameter, and put in the above-described mantle. In this way, we had, instead of the inner glass tube (fig. 3), one of an organic membrane surrounded by warm water; the water penetrates through this membrane so that its inner surface is always kept moist. The spiral wire prevents the intestine from collapsing. With experiments arranged in a similar manner to those described before, with  $L = 21$  *cm*, and  $2L = 42$  *cm*, and with a rapidity of 1 litre in 5 seconds, we obtain, mentioning only the final results, the following numbers:

	At a difference between outside and mantle-temperature	Heating of
L.	17°	9.5°
2 L.	17°	12.4°

We thus obtain, notwithstanding that the length and also the diameter of the tube remain the same as in the first schematic experiments, a much greater heating of the air, and also an evaporation of a certain unmeasured quantity of water, therefore a much greater delivery of heat. We think this must be ascribed to the *altered surface of the tube through which the air passes*.

With this we have imitated the conditions existing in the human nose as nearly as is possible by schematic experiments.

In our experiments the air-aspiration was performed with an equal rapidity of flow, namely, 1 litre in 5 seconds, corresponding to an air-quantity of 500 cubic *cm* inspired during one inspiration, and corresponding further to ten respirations per minute. According to my experience, we cannot count upon a variable number of respirations per minute in a quiet standing or sitting position; and I apportion about 2.5 seconds for an inspiration and 3.5 seconds for an expiration. A real unintentional respiratory pause, I could only observe with oral—only with a slow, deep inspiration—but not with nasal respiration.

If now I perform experiments with my simple aspiration-apparatus (fig. 1), I draw in the total quantity of air necessary for an inspiration, through both nasal cavities one after the other, this occupying the same time as when, during a natural respiration, half of this quantity flows through the nasal cavity of each side. When 500 cubic *cm* are required for one inspiration, each nasal cavity inspires 250 cubic *cm* of air. The rapidity which has characterized the experiments thus far is therefore double that of natural free respiration. In using the bottle-aspirator during inspiration, the rapidity of the air current in the nasal cavities is still much greater.

There still remains for us, therefore, the task of investigating the influence of the rapidity of the air current upon the taking-up of heat.

We experimented again with the glass tubes  $L = 21$  *cm* and  $2 L = 42$  *cm*, the copper tubes  $L = 2.08$  metre, and  $2 L = 4.16$  metre, and also with both pieces of intestine of lengths corresponding to the glass tubes. We were satisfied with a mantle-temperature of  $37^{\circ}$ , a difference between room- and mantle-temperature of  $17^{\circ}$ . We speak of the rate of air-current until now as  $2 V = 1$  litre in 5 seconds, and perform the experiments with the rapidity of  $V = 1$  litre in 10 seconds.

I give only a *tabular résumé of the results of the whole series of experiments.*



Arrangement of the experiment.	Difference between beginning and mantle-temperature.	Heating of the air.	Thus the second half of 2 L is heated, in addition.
<i>A.—Copper tube.</i>			
L V	17°	13.5°	—
L 2 V	17°	13.0°	—
2 L V	17°	14.0°	0.5°
2 L 2 V	17°	13.7°	0.7°
<i>B.—Glass tube.</i>			
L V	17°	5.6°	—
L 2 V	17°	5.3°	—
2 L V	17°	8.6°	3.0°
2 L 2 V	17°	6.8°	1.5°
<i>C.—Intestine.</i>			
L V	17°	10.5°	—
L 2 V	17°	9.5°	—
2 L V	17°	13.5°	3.0°
2 L 2 V	17°	12.4°	2.9°

With the long copper tube with its small diameter, the rapidity of the air current is of little importance; the heating is nearly the same in the single as in the double length, whether with single or with double rapidity. The curve indicating the absorption of heat has very strongly increasing ordinates in the beginning of its course, whilst very soon the additional absorption of heat by the air becomes relatively small. It is different with the relatively short tubes under *B* and *C* in the table. With these, and especially with the intestinal tube, which corresponds nearest to the conditions existing in the nasal cavities, the influence of the rapidity of flow on the absorption of heat is well-marked, though it is still small in proportion to the difference of temperature.

It appears from this that the influence of the rapidity of the air current should be taken into consideration; but we cannot compare the results of the experiments in which double rapidity is used, with natural respiration.

Furthermore, we see that the heating in the intestinal tube with 2 L 2 V and a difference of temperature of 17° is 12.4°, while it is only 10.5° with L V. When we compare this with nasal respiration—which is certainly allowable,—the heating with natural respiration (L V) is in proportion

to that in our aspiration experiments (2 L 2 V) as  $10.5^{\circ}$ :  $12.4^{\circ}$ , or, if we apply the experimental heating in the nasal cavities at an outside temperature of  $20^{\circ}$  to  $11.3^{\circ}$ , as  $9.5^{\circ}$ :  $11.3^{\circ}$ .

Thus, in order to arrive at the heating for natural inspiration from the former formula for the heating of the air in both nasal cavities (experiment), we say:

$$E = \frac{2}{3} \cdot \frac{9.5}{11.3} (37 - t), \text{ i. e.,}$$

$$E = \frac{5}{9} (37 - t);$$

and the final temperature in the nasal cavity with natural inspiration is, therefore,

$$t + \frac{5}{9} (37 - t),$$

in which  $t$  constantly represents the temperature of the outside air.

Thus with natural inspiration the heating is  $\frac{1}{3}$  less than in our aspiration-experiment; the difference may even be a little greater. If we perform the experiments, taking copper tubes of such lengths that the same heating, at a similar difference between outside and mantle-temperature as in the nasal cavity, results, this length is found to be 26 cm for 2 L.

With this length, i. e.,  $L = 13 \text{ cm}$ , with a rapidity of air current  $V = 1$  litre in 10 seconds, and 2 V, the following numbers result:

Copper tube 0.5 cm in diameter.	Difference between beginning and man- tle-temperature.	Heating of the outside air.	Thus the second half of 2 L is heated additionally.
L (= 0.13 metres) V	$17^{\circ}$	$9.8^{\circ}$	—
2 V	$17^{\circ}$	$8.8^{\circ}$	—
2 L	$17^{\circ}$	$12.6^{\circ}$	$2.8^{\circ}$
2 V	$17^{\circ}$	$11.3^{\circ}$	$2.5^{\circ}$

With a length of some 4 metres of the same copper tube, the heating was about the same as with a length of 2 metres, and with a length of 0.5 metres it is still about the same. After the air has passed through 0.5 metres of the tube, it has already received so much heat (at the relatively small difference of  $17^{\circ}$  against the mantle-temperature) that its increase is very slow in the remainder of its course. With

shorter distances, however, the difference between  $L$  and  $2L$  is of increasing importance in the absorption of heat; since here we are still in the beginning of the curve. When, with a length  $L = 0.13$  metre, the difference between  $L$  and  $2L$  is  $11.3 - 9.8 = 1.5^\circ$ ,—about the same proportion as in our experiments with the intestinal tubes,—it can be accepted that between half the length— $L = 0.065$  metre, about the length of the nasal cavity, and  $2L = 0.13$  metre—the difference of absorption of heat will be still greater.

After the consideration of the particular conditions of the nasal cavity in this manner, the following result is arrived at. **The inspired air, in its passage through the nose, gains in heat  $\frac{1}{2}$  of the difference between its temperature and that of the body.**

*Determination of the Temperature of the Expired Air.*

There is considerable increase in the humidity of the air after it has passed through the nasal cavities. The advantages of nasal inspiration become apparent when we substitute mouth-breathing for it. During oral inspiration the mouth becomes very dry; this disagreeable, dry feeling is felt from the lips to the throat. Besides this advantage—increase of humidity,—we find that the temperature of the air is raised more in passing through the nose, than in passing through the mouth. For the changes in temperature, however, we do not possess a subjective test, like that for humidity, unless we consider as such the peculiar coldness felt in the incisors after inhaling air of very low temperature through the mouth. We can, however, determine how much greater the heating capacity of the nose is than that of the mouth, by measuring the temperatures of expired air after nasal and after oral inspiration respectively. The air has a considerably lower temperatures in the pharyngeal cavity when inhaled through the mouth. The anatomical differences between the two cavities afford a ready explanation of this fact: the buccal cavity is shorter and wider than the nasal, the current of air passes through the mouth more directly, and hence comes much less in contact with the

mucous membrane, the heat-giving surface. In mouth-inspiration the air therefore reaches the lungs with a considerably lower temperature.

That this loss of temperature cannot be wholly compensated for in the lungs, has already been proven by Gréhant's experiments.

The following are some of the results of my efforts to determine the temperature of the expired air thermometrically. The end of the glass tube nearest the thermometer, (fig. 1—the rubber tubing having been removed) is placed into one nasal opening. During inspiration the other end is closed, and during expiration it is reopened.

*A.* The tube was placed in the right nostril; the inspired air passed through the left nasal cavity, the expired air through both nares. The mouth was kept closed. Respirations, 12 per minute.

In five experiments the thermometer showed :

35.0°	}	35.10°
35.0°		
35.2°		
35.2°		
35.1°		

Five more successive determinations gave :

35.0°	}
35.1°	
35.1°	
35.2°	
35.2°	

*B.* The glass tube was placed in the left nostril; the inspired air passed through the right; the expired air through both nares.

Mouth closed. Respirations, 12 per minute :

35.2°	}	35.26°
35.3°		
35.4°		
35.2°		
35.2°		

Five additional determinations :

35.2°	}	35.20°
35.2°		
35.3°		
35.2°		
35.1°		

During all these determinations, the temperature of the room was uniformly  $24^{\circ}$ .

C. Inspiration through the mouth; expiration through the nose; the glass tube in the left nostril:

$$\left. \begin{array}{l} 35.1^{\circ} \\ 35.0^{\circ} \\ 34.8^{\circ} \\ 35.1^{\circ} \\ 34.9^{\circ} \end{array} \right\} 34.98^{\circ}$$

The glass tube in the right nostril:

$$\left. \begin{array}{l} 35.2^{\circ} \\ 34.8^{\circ} \\ 35.0^{\circ} \\ 35.1^{\circ} \\ 35.0^{\circ} \end{array} \right\} 35.02^{\circ}$$

The temperature in the room during experiment C was  $18^{\circ}$ ; but since we were dealing here only with the temperature of the expired air, this difference in external temperature may be ignored.

D. Inspiration and expiration through the mouth; external temperature  $24^{\circ}$

$$\left. \begin{array}{l} 33.6^{\circ} \\ 33.3^{\circ} \\ 33.0^{\circ} \\ 33.3^{\circ} \\ 33.4^{\circ} \end{array} \right\} 33.32^{\circ}$$

Additional determinations:

$$\left. \begin{array}{l} 33.7^{\circ} \\ 33.3^{\circ} \\ 33.2^{\circ} \\ 33.1^{\circ} \\ 33.1^{\circ} \end{array} \right\} 33.28^{\circ}$$

*Nasal respiration, therefore, at an external temperature of  $24^{\circ}$ , raised the temperature of the expired air  $1.8^{\circ}$ —a figure but slightly greater than that arrived at by Gréhant, with an external temperature of  $22^{\circ}$ .*

We cannot obtain reliable results by determining the temperature of the inspired air directly in the pharyngeal cavity; for heat is radiated from the mucous membrane of the buccal cavity, and it would be impossible to exclude the influence of the surrounding walls of the pharynx and of the floor of the buccal cavity.

I made such experiments with an external temperature of  $10^{\circ}$ ; the thermometer was placed in the widely open mouth during inspiration only, and held in position between the uvula and palatal arches, near the posterior pharyngeal wall. The moment the act of inspiration began, I withdrew the thermometer, and introduced it again at the beginning of the next inspiration. The mercury never rose beyond  $16^{\circ}$  —  $16.2^{\circ}$ ; and even this figure seems too high when we take into consideration the effect of the radiation mentioned above.

We must admit, however, that the temperatures obtained depended upon the area, in cross-section, of the buccal cavity; for when the mouth was but slightly opened, the thermometer showed a smaller rise in temperature. The same air would, however, have been heated to  $25^{\circ}$  in passing through the nasal cavity.

*Computation of the Heating Effect of the Nose during Inspiration.*

The rise in temperature of the inspired air is not a sufficient expression of the heating effect of the nasal cavities. Evaporation from their surfaces also makes a considerable demand upon their thermogenic capacity. Experiments will be detailed further on, which show that at an external temperature of  $16^{\circ}$  and a dew-point of  $10^{\circ}$  the nasal cavities evaporate about 0.00546 gramme of water during every inspiration.

At a dew-point of  $10^{\circ}$ , the air contains 9.38 *gram* of aqueous vapor per cubic metre; at  $28^{\circ}$ , *i. e.*, the point to which the inspired air has been raised in traversing the nasal cavity, it contains 27.10 *gram* of aqueous vapor, when completely saturated. But the humidity of the air while passing through the nasal cavity never exceeds 62 per cent.; therefore, in our example, the air would contain only (63 % of 27.10) 17.06 *gram* of aqueous vapor. We must also deduct from this latter weight the original 9.38 *gram* which the external air contained. Therefore the nasal cavities evaporate a quantity of water equal to  $(17.07 - 9.38)$  7.69



gram per cubic meter of air, and at every inspiration of 500 cc only  $\frac{7.69}{3,000}$  or 0.00385 gram of water.

The latent heat  $\bar{L}$ , at a temperature of  $t^\circ$ , that is, the amount of heat which is necessary to change a unit of water from a temperature of  $t^\circ$  to vapor at the same temperature, is:

$$L = 607 - 0.708 t.$$

In our case  $t = 37^\circ$ .

$$\therefore L = 607 - 26.196 = 580.8.$$

Therefore the amount of aqueous vapor absorbed during one inspiration is  $0.303846 \times 580 = 2.23$  gramme-calorics.

If we wish to determine the amount of heat required to raise 500 cc of inspired air from a temperature of  $16^\circ$  to that of  $28^\circ$ , as takes place during ordinary inspiration, we must consider the following facts: One litre of air at normal temperature and pressure weighs 1.294 gram; 500 cc of air, therefore—the amount of one inspiration (= g)—weigh 0.64 gramme.

The specific heat (= c) of air at a constant temperature is equivalent to 0.23. With the aid of these numbers the quantity of heat furnished by the nose is obtained according to the formula:

$$W = cg [t + \frac{5}{9} (37 - t)].$$

Substituting for t, external temperature,  $16^\circ$ , we obtain:  
 $W = 0.23 \times .064 [16 + \frac{5}{9} (37 - 16)] = 4.06$  gramme-calorics.

*At an average temperature of the air, and with an average degree of moisture in the air, the thermogenic effect produced by the nose during an act of inspiration, is*

$$4.06 + 2.23 = 6.29 \text{ gramme-calorics.}$$

With 15 respirations per minute, a simple calculation shows the amount of work done by the nasal mucous membranes in 24 hours to be 130,000 gramme-calorics.

*(To be continued in March number.)*

## REPORT OF CASES OF DISEASE OF THE MASTOID PROCESS, WITH REMARKS.

By HENRY FERRER, M.D., SAN FRANCISCO, CAL.

### CASE I.—Chronic Purulent Inflammation of the Right Middle Ear; Spontaneous Perforation through the Bone; Two Operations; No Communication; Cure in Eight Weeks.

Magnus H—, twenty-two years old, from Sacramento, was brought to me by Dr. M. Richter, April 3, 1877. He states that his right ear has been discharging for several years, and lately, after a cold, the discharge increased and at the same time he noticed a swelling behind the ear, but never had any pain.

*Status Præsens*: Profuse fetid purulent otorrhœa, ext. meatus normal, middle-sized perforation in lower post. segment of memb. tympani; in mastoid region, a small fluctuating swelling the size of a hazel-nut, no redness, nor any diffuse swelling of integuments.

*Treatment*: Incision of abscess, emptying half a teaspoonful of pus; the surface of the bone was found rough, and with the probe a small fistula leading into the bone was detected. The treatment consisted in inflating by Politzer's method, syringing fistula as well as meatus with a solution of permanganate of potassa. April 4th, the fistula as far as could be penetrated was scooped out and the cleansing continued daily until the 24th, when, finding but little improvement, patient was etherized and operated a second time. A fresh incision was made, the periosteum pushed aside, and the fistula, which was filled with granulations, thoroughly scooped. In syringing no communication was obtained.

Patient was in bed not one day. The operation was performed in my office, and after resting awhile he walked home and was treated as an out-door patient.

The fistula was well drained, and the same dressing continued

daily. He at once began to improve, the discharge from middle ear ceased in a few days, and by end of June the fistula was closed.

The noteworthy features of this case are the total absence of pain even when and after perforation had taken place ; no fever ; no communication obtained by the operation.

**CASE 2.—Acute Purulent Inflammation of Left Middle Ear, with Profuse Suppuration ; Death, Eight Weeks after Operation, from Hematemesis.**

Mr. G. H—, ætas sixty, consulted me March 16, 1880, for suppuration and pain in the left ear, acquired on the overland train three weeks previous. Patient, well nourished, was never ill before. I found profuse purulent discharge from left meatus. I attended to him daily, and April 14th, the discharge and pain not decreasing, opened the mastoid with gouge and scoop. Integument as well as periosteum and ext. plate were normal. As soon as ext. plate was opened a large quantity of pus escaped, the intercellular septa being mostly destroyed. The pus did not occupy the whole cavity, but chiefly the irregular peripheric portion ; the greater part of the cavity was filled by a dark-red gelatinous substance, the degenerated mucous membrane of the air-cells. All this gelatinous substance was carefully scooped out, and in syringing free communication with the middle ear and meatus had been obtained. The patient was treated in the usual manner ; the cavity soon began to granulate rapidly. Patient yet complained continually about his head, and upon consultation we decided to scoop out all the granulations, which was accordingly done. Every thing about the ear was going on satisfactorily when patient, who had been drinking brandy regularly, was taken with hematemesis, and died on the 11th of May. At the autopsy I was not allowed to remove any bone. The cranial cavity was opened in the usual manner ; the brain and meninges were found normal. I then chiselled the tegmen tympani open, and found the cavity of mastoid filled with granulations, freely communicating with the middle ear. In the latter we found pus and swelling of the mucous membrane. The main pathological change found in the internal organs was a well advanced cirrhosis of the liver ; in the distended stomach, some dark fluid blood.

**CASE 3.—Acute Inflammation of Right Middle Ear ; Empyema of Mastoid ; Operation ; No Communication ; Cure in Fourteen Weeks.**

Carl H., ætas forty-eight, German, consulted me January 4, 1881. Four to six weeks previous he had been hard at work and perspired freely. The same evening while at home he had an ear-ache, and, being a brewer, he naturally applied warm hops, which relieved the pain for the time being. He could not sleep for a few nights until his ear began to discharge and the pain diminished. A few days afterwards the whole side of the head and face began to swell. Hops had been applied continually, and when I saw him he was totally wrapped up in woollen cloths. Patient, a small, well-set, powerful man, never had a day's sickness in his life.

*Status Præsens*: Œdematous swelling of the right side of the head and face, the nearer to the ear the harder and more inflamed the integuments were; the auricle very much swollen and almost in erysipelatous condition. Profuse purulent discharge from the meatus; after drying with cotton the meatus was hardly permeable, on account of the swelling and collapse of its walls. I sent patient at once to the German Hospital with directions to have his hair cut and his head thoroughly disinfected and shaved round the ear. Ice was applied to the head, and the ear was syringed daily with one-per-cent. carbolized water; Politzer. This was continued, but with little improvement, until the 10th, when the patient consented to be operated.

*Operation*: Large incision through external integuments, which were in condition of purulent, lardaceous infiltration. Periosteum yet adherent; external plate normal. Perforated with gouge without hammer; external plate 3 mm thick. This perforated, pus began to ooze out freely, and on probing I could ascertain that the whole mastoid had been transformed into a large abscess. With Luer's sharp bone-forceps the undermined portions of external plate were removed, thus obtaining a cavity of semi-ovoid form with an external opening of  $3\frac{1}{2}$  by 3 cm and 2 to  $2\frac{1}{2}$  cm deep. The inner surface of this cavity was scooped carefully until smooth; the hemorrhage being then considerable, it was filled with carbolized gauze cut in small pieces, and a compressive bandage was applied. The following day the external portion of the bandage, which was saturated with blood, was removed, and in doing so the gauze in the cavity was found saturated with blood, and blood dripped out. It was therefore not disturbed, and a bandage re-applied. Patient had no fever, was entirely free from pain, the discharge from the meatus reduced to about one third. Twenty-four hours later I found the bandage slightly saturated with

blood; removed all the gauze in the cavity, produced slight hemorrhage, syringed with carbolized water, and dressed in the same manner. Swelling of meatus very much decreased and discharge slight. From now on I had no more trouble with the case. The fourth day patient was not to be kept in bed, and having neither fever nor pain, I found no reason for not allowing him to promenade in the hall. In a very few days the external meatus was of normal size; no discharge; the membrana tympani covered with dried epidermis; no perforation upon inflation. The large cavity soon began to granulate in all directions, and the large external opening favored the healing process by the extension of the granulations of the soft external integuments into the cavity; thus no drain was ever required. By the 15th of June the patient was discharged perfectly cured, with fair hearing, and a large oval depression on mastoid.

This case shows in how short a time the septa dividing the cells in the mastoid can be totally destroyed and the whole appendix transformed into a large abscess. It is strange that no communication was ever obtained between mastoid and middle ear, though we must admit that the very profuse discharge was not produced in the middle ear but in the mastoid, and that the first was only the outflow for the same. The rapid disappearance of the otorrhœa after the operation corroborates this view. The very profuse hemorrhage proceeded from the distended blood-vessels of inner plate, and was the most copious I had yet seen. In similar cases of hemorrhage I think that packing of the cavity with iodoform gauze is the best. Molding wax has been recommended, which may be found useful in cases where the walls of the sinus have been injured.

**CASE 4.—Chronic Purulent Inflammation of Middle Ear; Spontaneous Perforation of Mastoid with Two Fistulas; Operated Twice; Cure in One Year.**

Boy, H., six years old, was brought to me May 12, 1882. All I could ascertain from the mother is that the boy had discharge from right ear several months; at times the discharge would disappear to show itself after a restless night with earache. At times again the fetid odor from the ear would be such that children in school objected to sit near him. Several weeks ago he had a restless



night, and in the morning the mother found a swelling back of the ear, which opened after a few days' poulticing. Then the discharge from and behind the ear would cease and one or two weeks afterwards, the swelling would form again, break, and heal up under the same treatment. This repeated itself several times; the last two or three times the swelling had opened in two places, one above and one behind the ear.

*Status Præsens*: Poorly nourished child, kept dirty in every way, head bandaged by filthy rags, the well-known otorrhœa odor noticeable at a distance. Auricle swelled, its post. surface erysipelatous. The integument of the temporal bone was livid red, mostly denuded of epidermis, and covered with fetid pus oozing from two fistulas, one above the meatus at post. sup. insertion of auricle, one behind about 2 mm from its post. insertion, both filled with granulations. With a probe the cutis covering the temporal upwards and backwards could be lifted up from the bone and was as thin as paper. The external plate of the bone was denuded and rough and from both fistulas the probe could be introduced 2 to 2½ cm through rough bone in the direction of the middle ear. The meatus filled with fetid pus, its inner portion with fungous granulations. Operation May 13th, under narcosis. The previous day in syringing through either of the fistulas I had convinced myself that the fluid would flow readily from the meatus. This one treatment had diminished the fetor considerably. I divided the external integuments from one fistula to the other and carefully scooped out some of the granulations extending into the bone. The extensive affection of the internal plate and the two fistulas, one leading directly into the antrum the other in the horizontal cells, made me cautious, though the child had not had any symptoms of affection of the brain. The tedious treatment of syringing with carbolized water and antiseptic dressing I attended to personally daily during eight months, to the 16th of December. To tell here all I observed and noted during this period would surely be imposing upon the kind readers, and yet I cannot help entering somewhat minutely into the case on account of the extensive destruction which had taken place and the complete, I must say unexpected, recovery. The granulations began to form under the almost sloughed cutis, and they became firmly attached to the ext. plate, which I supposed was necrosed. The discharge gradually decreased, lost its fetid character, and a free communication between both fistulas and the ext. meatus existed



all the time. From the 16th of December on, the mother, who had several children at home, thought she could attend to the child herself: thus the latter part of December I saw him three times; in January, 1883, not at all; and in February, March, and April, once a week. Beginning of May the posterior and lower fistula had closed, but the discharge from the upper one had increased. A sequestrum could be felt by probing; it was movable, but too large to be removed without enlarging the opening. This was done under ether with the kind assistance of Dr. M. Richter. It was wedge-shaped, had a smooth base, one side 1 cm long, and a height of  $1\frac{1}{2}$  cm of rough porous substance, undoubtedly a portion of the superior bony wall of upper meatus and some of the horizontal cells. Syringing was continued by the mother, and by the end of May she presented her child perfectly cured.

In this case death was expected, not so much on account of the destruction of bone, but more so because the whole temporal bone was denuded of periosteum, and its squamous portion of dark yellow, almost brown color, with roughened surface having all the characteristics of being necrotic. During the whole treatment no granulations were ever seen to form directly from the bone itself. The granulations sprang from the neighborhood where the galea was healthy, as could be observed in lifting up the then atrophied cutis of the affected parts. I feared the cutis might slough, but it did not; some shrinking took place, yet it soon gained vitality by adhering to the underlying granulations,—I may say almost a self-grafting. Though nothing was ever done to the granulations in middle ear they all disappeared with the discharge from the mastoid, and when the patient was dismissed the memb. tympani had been completely eliminated. The internal portion of the meatus was narrowed and somewhat slit-shaped; the exact condition of the middle ear could not be ascertained.

**CASE 5.—Chronic Otorrhœa on Right Side with Acute Mastoiditis; Operation; Cure.**

Sp. P., male, ætas 54, consulted me April 26, 1883. He had been affected with otorrhœa on right side for several months. The discharge had been slight, and of fetid odor, until a few weeks previous, when, after a cold, it became very profuse, and

was accompanied by considerable pain in the ear and on whole side of the head.

*Status Præsens* : Externally, nothing abnormal ; mastoid region shows no signs of swelling or sensitiveness to pressure. The discharge was copious and purulent ; after syringing and drying meatus, it appeared perfectly normal. Memb. tympani, red and thickened, was perforated in its lower anterior segment.

*Treatment* : I at once enlarged the perforation down and backwards, inflated by Politzer, and syringed carefully with carbolic solution. Externally cotton bandage applied. The same treatment by inflating and syringing was continued twice daily until May 7th ; it had no beneficial influence whatever ; the discharge remained the same, and besides, the pain had increased and become unbearable at night, opiates being resorted to. The region of mastoid never showed signs of swelling, and only upon very strong pressure it appeared to be more sensitive. The calibre of external meatus was perfectly normal. Patient had no appetite, had lost considerably in weight, and became very impatient, having the idea that the pain was going to drive him insane.

*May 8th.*—Operation in German Hospital, under ether, with gouge and chisel and sharp scoops. Integuments perfectly normal as well as external plate. With a short gouge, having a short, thick wooden handle, the external plate was perforated, in circumference of 1 cm and close to external meatus. At a depth of 3 mm fluid pus escaped ; the opening was made uniform, and the contents of mastoid scooped out. Besides the pus, a mushy substance, consisting of the swelled degenerated mucous membrane, and part of trabeculæ were evacuated. On syringing communication obtained. Cavity filled with carbolized gauze ; cotton and flannel bandage externally. The following day patient left his bed, he had neither pain nor fever and preferred to be up. He was treated daily in the usual manner until the middle of June, when I inserted a fine cylindrical lead tube with a flange. End of July he left for home, where he intended to place himself under a physician's care. The discharge from meatus had rapidly decreased, and when he left there was no more discharge and no communication. Patient's general health had improved wonderfully. I then lost track of him, but have been assured by one of his friends that his ear was entirely cured, and had never given him any more trouble.

The only remarkable feature in this case is the empyema

of mastoid without the least sign in the external integuments either in mastoid region or in meatus. The lead drain used, about  $2\frac{1}{2}$  mm in diameter with a round flange, is identical to the one I have seen used by Prof. Lucae in January, 1885. Had I then known the true shape of Schwartz's conical solid lead plug, which I now use altogether, no doubt the recovery in this case would have been shortened. The hollow cylindrical lead tube is too thin to drain, besides its inner opening becoming plugged by granulations. The same objections are found in all cylindrical drains with side openings. The only drain that answers the purpose is Schwartz's conical lead plug, and the more conical the better it is. Its shape, as represented by the engraving in Schwartz's "Aural Surgery," fig. 118, page 346, is a nail as purchased, and as such cannot be used at all, but has to be shaped, cut, and smoothened to fit the case. Besides, I must say that this wood-cut is not accurate, the nail being represented almost cylindrical, while those generally used by Schwartz are much thicker at the base and more conical. As to the material, I have convinced myself that pure lead is the best metal to use. When in Halle, end of 1884, I tried a silver plug, but could not find fine silver. In Vienna I had a rod of pure aluminum prepared, and have tried nails of the same. Since my return I have tried conical nails of fine silver and fine gold; none of these metals answered the purpose, not being as easy to work and pliable as the lead. Dr. Kretschman experimented with nails of hard rubber with the same result.

**CASE 6.—Acute Purulent Inflammation of Right Middle Ear, Extending into Mastoid; Operation; Diabetes; Death from Pneumonia.**

M. B., male, fifty-seven years old, affected with diabetes, consulted me November 13, 1883, with abscess of external meatus and otitis media suppurativa acuta on right side, contracted a few days previous. The abscess was opened, the otorrhœa treated with inflations of the middle ear and injections of carbolyzed water into the meatus. The discharge from middle ear kept increasing, and the pain became excruciating, yet there was neither swelling nor sensitiveness of mastoid upon pressure. I sent patient to the German Hospital and operated December 18th.

*Operation* : External integuments normal ; periosteum firmly adherent to the bone. External plate of normal color, very thick, compact, no air-cells visible until almost 2 *cm* deep, when I reached a small cavity which I supposed to be the antrum ; it was filled with inspissated pus. On syringing communication existed. Dressed as usual with carbolized gauze and iodoform. After twenty-four hours the bandage was renewed. Suppuration diminished greatly ; a few days later a drain-tube was inserted, and later replaced by a hollow lead nail with flange as used by Lucae. In the meatus nothing abnormal could be observed, the pale-red thickened membrana tympani showing a small perforation in its lower posterior segment. A probe could be introduced forward and upward into the horizontal cells, probably the seat of the disease ; it was always followed by slight hemorrhage from the granulations. In other places inward and forward the bone was felt rough. Patient was treated daily with antiseptic solutions either by me, my assistant, or a competent nurse until March 14th. Then the communication became obstructed, the nail could only be introduced with difficulty, the discharge both from meatus and fistula having increased, and spells of dizziness having set in which were brought about by the slightest pressure upon the nail. I decided to operate a second time in order to enlarge the fistula, insert a larger drain, and restore the communication. By a simple procedure, requiring only a sharp scoop, the desired effect was obtained, and the patient's general health improved again. I then left for Europe, having placed him under proper attendance.

February 3, 1886, a few months after my return, he called on me again ; he had left the hospital shortly after my departure and had attended to his own case. I found him very much emaciated, slow in answering questions, hardly able to walk on the street, staggering at times as if intoxicated. Supposing that all these symptoms were produced by the nail being too long and pressing upon the brain, he shortened it several times. Discharge from meatus was more abundant, and fistula so far contracted that only a fine probe could be introduced to the depth of 2 *cm*.

In the meantime I had had three months' schooling with Prof. Schwartze, in Halle, to whom I am indebted for all I know in the pathology and treatment of mastoid affections. I had convinced myself that a small hollow cylindrical nail

as I used, and later on saw Prof. Lucae in Berlin use, was not practical, and the canal in it of no use for draining purposes. Totally converted to Prof. Schwartze's doctrines by the many cases I saw and was allowed to treat in his clinic, and two cases that he allowed me to operate under his kind guidance, I decided to operate and treat this, my sixth case, for a third time after my teacher's method.

This was done, February 10th, under ether narcosis in such a way as if patient had never been operated before and if the fistula were spontaneous. The integuments divided and periosteum detached sideways; the fistula was scooped out, and its external orifice enlarged with chisel and mallet to  $1\frac{1}{2}$  cm in diameter, narrowing inwardly so as to form a conical tunnel. Good communication existed, and the following week a conical solid nail 3 cm long and 5 mm wide at the base was introduced and held in position by a headspring. The operation was followed by more relief than any of the previous ones; in a short time the discharge from meatus disappeared entirely, even the perforation of the memb. tympani closed, and his hearing was  $h = \frac{6}{300}$ . When a catheter was introduced the air passed freely through the fistula, and there being no discharge from this I began to shorten the nail. Patient was then taken with pneumonia and died in the German Hospital on the 17th of March, 1887.

The temporal bone was removed by the resident physician of the hospital and placed in absolute alcohol. Several weeks afterwards, I made an examination of the body with the following result. A vertical section was made with a saw dividing the mastoid process, beginning in the centre of the opening of external plate, and running inwards in order to bisect the nail cavity in its entire length.

The funnel-shaped hole which had been chiselled into the bone was filled up with dense cicatricial tissue, not the least trace of ossification being noticed anywhere. This tissue filled whatever had been scooped off the mastoid, and was all over perfectly adherent to the bone, more so in the deeper portions. The cicatricial tissue was naturally formed by the transformation of the granulations in the cavity of the bone, being entirely independent of the external soft integuments, especially the periosteum. This was



easily seen in tearing off the skin covering the mastoid, the periosteum being easily detached from the bone and the borders of the external opening. The cicatricial formation extended through the aditus ad antrum into the middle ear, where it produced extensive adhesions between the ossicles. Four of the horizontal cells of the upper wall of meatus, two of them of large size, had open communication with the fistula in the bone at first, but had been excluded by the granulating process, and were probably all the time the seat of fresh or continued suppuration. The membrana tympani was exceedingly thick, the cicatricial tissue apparently extending from the mastoid through the aditus, and lining equally well all the walls of the middle ear and inner surface of membrana tympani. There was still fair communication between nail cavity and cavum tympani, the aditus not being totally closed.

This is the first specimen I have had an opportunity to examine after an evisceration of the mastoid, but from this alone, and from the external appearance of the cases I have seen cured, it seems to me that no formation of bone substance ever takes place, but merely a cicatricial formation. When the fistula chiselled in the bone is very narrow, the contraction is such that to the touch one would believe in ossification, but in all cases in which more or less of the external plate has been removed a depression is found which often remains sensitive to pressure.

**CASE 7.—Acute Purulent Inflammation of Right Middle Ear; Spontaneous Perforation of External Plate; Incision of Abscess; Recovery in Three Months.**

K—h, male, 32 years old, consulted me in April, 1884, for acute inflammation of right middle ear and purulent discharge which he had contracted several days previously. The case was considered simple, and treated with a solution of boracic acid, Politzer, and Priessnitz bandage. The discharge was moderate, the walls of the meatus were not swelled, membrana tympani injected with a small pulsating perforation in lower post. segment; externally auricle and mastoid region perfectly normal. The process did not seem to be affected by the treatment; patient began to complain of sleepless nights, had no fever. After two



weeks' treatment he presented himself perfectly relieved from pain, but with a small swelling behind the ear. This was opened at once, emptying less than half a teaspoonful of pus. The following day the discharge from meatus had disappeared; with a fine probe a fistula could be felt in ext. plate. I did not see patient again until the beginning of 1886, when he stated that he had continued taking care of his ear for a few days longer, in the same way as I had done. The wound behind the ear closed in a few days, and there was never again any discharge from the ear. Hardly any sign of a cicatrix can be noticed on mastoid; memb. tympani slightly thickened, no signs of perforation,  $h = \frac{5.0}{200}$

In this case we must admit that the primary affection began in the mastoid as well as in the middle ear, and that the external plate was very thin, the air cells communicating freely with each other and with the antrum. Not familiar at the time with the forced injections, I did not ascertain whether a communication existed. Peculiar also was the spontaneous perforation of the external plate, without any swelling of external integuments.

**CASE 8.—Chronic Otorrhœa Right Side, with Eburnification of External Plate, Caries and Necrosis of Inner Portions of Mastoid Process; Two Operations; Communication Obtained after the Second Operation; Tuberculosis Pulmonum; Partial Recovery.**

M. C.—, 27 years old, male, from Los Angeles, Cal., consulted me in December, 1882. In September, of the same year, he first experienced some pain in the right ear, with severe inflammation of the walls of the meatus. Dr. Kurtz attended to him first, and after the swelling had subsided he found a perforation of memb. tympani. I found moderate purulent discharge, which yielded to ordinary treatment, and after two weeks he was dismissed cured, having no further trouble for several months. About one year later he experienced a disagreeable throbbing of the right temple, which increased gradually and became so distressing that he called in a physician, who removed from the meatus a lump consisting of cotton covered with pus and cerumen. This foreign body was as hard as "rock" and the removal so painful that patient fainted. Ear drops were used, the throbbing and pain subsided, and beyond some discharge he had no further inconvenience. During the autumn of 1885, he visited

Germany where his ear inflamed again. He applied to Prof. Magnus in Königsberg, who treated him during two weeks, and gave him to understand that he had treated him for a fistula in the middle ear, which, however, had not yet reached the bone. Then he applied to Prof. Lucae in Berlin, who agreed in treatment with Prof. Magnus and pronounced the ear in good condition. The throbbing in the temple continued with unabated force, and, rather discouraged, he returned to Los Angeles. Shortly after his arrival the discharge reappeared, and this time so copious that he came to this city to consult me. I being in Europe, he saw Dr. Barkan, who treated him with boracic acid in powder and solution and finally with the galvanic cautery. This was followed by great swelling of the meatus, which "virtually" closed up, and nothing could be done for a time. He then consulted Dr. Martinache, who informed him that very likely the bone was affected and an operation might in course of time become necessary. This suggestion meeting with his approval, he intended to go to New York when I arrived in San Francisco. On November 2, 1885, I found his ear in the following condition :

Externally normal, inner portion of external meatus narrowed by swelling of its walls. Moderate, thin, greenish, fetid purulent discharge. After thorough cleansing memb. tympani thickened, pale-red, with a fistula in upper posterior portion of membrana Schrapnelli. On probing no rough bone could be felt. By inflation either by Politzer's method or the catheter, no perforation sound heard. On account of obstruction of the right side of the nose a catheter with proper curve had to be introduced through the left nostril. No swelling or sensitiveness of mastoid region. I began my treatment by enlarging the fistula downward, which was repeated several times before the operation, and thus obtaining free passage for the air; injected through the catheter a weak solution of pure chloride of sodium after Schwartze. Besides, the external meatus was syringed with a  $1\frac{1}{2}\%$  solution of carbolic acid, and the small granulations which presented themselves were removed with a cold snare. The discharge gradually decreased but the throbbing pain in the temple continued and, besides, he now and then had dizzy spells and pain by pressure on mastoid. In February, while he was under treatment, the discharge increased and the subjective symptoms became so alarming that I decided to chisel open the mastoid, which was done in the German Hospital the 8th of February, 1886.

*Operation:* Ether narcosis. Operation after Schwartz, external integuments and periosteum normal; outer plate exceedingly hard and thick. With chisel and hammer I penetrated 2 *cm* through the eburneated bone, at which depth the bone substance became softer, more hyperæmic, and was scooped out to a depth of 2½ *cm*. No communication was obtained on syringing. Apart from the after-effects of the narcosis, no reaction ensued; he remained in bed three days, from then on he was able to walk about in the house or in the garden, and was in better spirits. The dressing, consisting of iodoform and carbolyzed gauze, was removed every 24 hours during the first four days and then twice daily. The discharge from meatus had ceased entirely though no communication was obtained. Beginning of March a lead nail was applied to keep the fistula open for slight discharge had made its appearance in the meatus, and the patient began to complain again of throbbing pain and dizziness. These symptoms increasing I operated a second time, the 26th of March, with the intention of penetrating still deeper and thus try to obtain communication. The incision was made on the old cicatrix, the fistula in the bone scooped as far as possible, then working with chisel and hammer I gradually penetrated to a depth of about 3 *cm*. Hemorrhage was comparatively profuse; communication being obtained on syringing, the dressing was applied. In a few days he left the hospital and was treated once or twice in 24 hours according to requirement. Three weeks after the operation the nail was applied, which this time had a length of over 3 *cm*, 2½ *cm* of which were actually in the bone, over 1 *cm* in the funnel-shaped depression. August 5th, six months after the second operation, the patient, who had become familiar with the after-treatment, left for home supplied with a pump and all requirements and instructions needed, promising to return as soon as communication was obstructed. His condition then was as follows: The external cicatrix was funnel-shaped and over 1 *cm* deep, then the regular channel for the nail began and was 5 *mm* wide by 2½ *cm* deep; at this depth the inner plate could be felt rough, denuded, and probably necrosed. The ext. meatus normally wide; memb. tympani drawn in, thickened, irregular, apparently adherent to the promontory, with a small fistulous opening backward and upward in the memb. Schrapnelli. The discharge is scanty, but truly purulent and at times greenish, no fetid odor. The patient's general health has improved wonderfully. At intervals he informed me that he

was doing well. August 7, 1887, he came to the city ; feeling unwell he was attended to by Dr. Richter for a fistula scroti from tubercular epididymitis. He remained here till the 20th. March 19th he called again ; granulations had formed in the communication channel with middle ear ; they were cauterized and passage restored. He remained under treatment until May 9th. August 6th, he presented himself in very poor health, but no special change was found in the ear. He was syringed daily until the 20th when he left for home in order to make proper arrangements to go to Prof. Schwartz at Halle.

*Remarks.*—Here the question arises, Of how much benefit were the two operations to a man who, from the beginning of the trouble, was known to be tuberculous? In November, 1885, I had already found the tubercle bacillus in his scanty expectoration, and solidification at the apex of both lungs. The indications for the first operation were the increased purulent discharge, and more so the distressing dizziness, and throbbing of the temple. The lack of success in obtaining communication in the first operation was caused by some timidity on my part, and by the extreme hardness and thickness of the external plate produced by the chronic otorrhœa. Having reached a depth of  $2\frac{1}{2}$  cm, and following the rules of my teacher, I desisted from penetrating deeper until compelled to do so. Wonderful is the improvement noticed, even after such unfinished operation ; the probable reason for it has been already mentioned by Schwartz. The very same symptoms made me decide to operate a second time and obtain communication which could not be dispensed with. No more dizziness or throbbing ever since, and the ear has been of but little trouble to the patient. Prof. Schwartz advises the operation in tubercular patients when the affection of the lungs is not too far advanced, and has found improvement in all his cases ("Chirurgische Krankheiten des Ohres," 1885, p. 353).

How much more can or will be done in this case will be published later on, as I intend to meet patient at Prof. Schwartz in April, 1889.

**CASE 9.—Chronic Purulent Inflammation of Left Middle Ear ; Abscess in Parotid Region ; Paresis during**

**Several Months, Ending in Complete Paralysis of Left Side of Face; Chiselling of Mastoid without any Benefit; Spontaneous Elimination of Two Sequestra through a Fistula in Upper Part of Meatus; a Part of the Facial Canal and the Entire Cochlea;—Complete Recovery.**

Mr. A1—r, ætas twenty-seven, consulted me March 6, 1886, for chronic otorrhœa on left side. The affection lasted from boyhood. He has never been seriously ill, and never had medical attendance. About six months ago he was taken overnight with severe pain in the ear and swelling on left parotid region. The attending physician ordered poultices, and a few days later lanced the swelling, emptying a large quantity of very fetid pus. He felt relieved at once, the swelling decreased rapidly, but at the same time he discovered that his tongue was a little heavy in speaking, and that he had some difficulty in drinking. The discharge from the ear, which had also increased when the swelling occurred, had been treated with injections. The wound and swelling in front of the ear had healed in a few days.

*Status Præsens*: Slight paresis of left side of the face, which can only be noticed by close examination. A vertical linear scar, 3 cm long, about 2 cm in front of base of tragus. He still has some difficulty in drinking. No swelling or pain in parotid or mastoid region. Moderate purulent discharge from meatus; after cleansing found its inner portion occupied by a large polypus. The greater portion of the polypus was at once removed with the snare, the remainder cauterized with pure nitrate of silver; inflation according to Politzer, slight quantity of boracic powder blown in to keep walls of meatus dry, and a long pellet of absorbent cotton, filling without pressure the whole meatus. At first I saw patient every other day; in a few days all that could be seen of the polypus had been destroyed. The membrana tympani was thickened; a perforation was supposed to exist in memb. flaccida, where the polypus had its origin. Walls of the exceptionally wide meatus perfectly normal. The impossibility of introducing a catheter prevented me from using injections or inflation in this way. Patient had no pain, but complained all the time of being very light-headed and unfit to attend to his business. The discharge remained very copious; his appetite failed; he became at times so dizzy that he had to lie down, and occasionally vomited after meals. Though he had no pain or swelling of mas-



toid region, his general condition became so alarming that I decided to chisel open the mastoid. For this purpose I sent patient to the German Hospital, where I operated March 6, 1886.

*Operation:* The incision 5 to 6 *cm* long made in usual way, the integuments being perfectly normal. Ext. plate normal; spina supra meatum and emissary openings barely visible. I began to chisel, and found the bone compact and exceedingly hard; after penetrating 3 or 4 *mm*, finding no cells, I concluded that I had before me an eburneated mastoid. Having no air-cells to guide me, I continued my work carefully until I had reached a depth of  $2\frac{1}{2}$  *cm*. Here I came to a small cavity, which I supposed to be the antrum, and probing I found that I could pass a thin silver probe into the meatus at a spot directly in front of the memb. flaccida. I also succeeded by cutting into the inner portion of the upper wall with a sharp-pointed bent bistoury to introduce a thin drain-tube from the mastoid into the meatus. The soft parts were united with several sutures. Dressing antiseptically with iodoform gauze, etc. The following day the patient felt well; had no fever; the discharge from meatus decreased considerably. He remained eight days in the hospital, and finding no cause for leaving the drain-tube, I removed it and sent him home. For several days he called at my office daily, to be treated, feeling as light-headed as ever, and one day becoming so dizzy after the treatment that he had to sit a few minutes on my door-steps before being able to proceed home. These spells he had several times, and the alarmed family asked Dr. De Vecchi in consultation. Patient was kept in bed several days, and treated in the same manner. The wound in mastoid granulated very fast, a conical nail 2 *cm* long was applied, and held with a spring in place of a bandage; there was still moderate discharge from the meatus. Middle of April the nail, which had been gradually reduced, was removed, and the mastoid closed in a few days. He seemed to gain confidence in himself, and allowed his wife to syringe his ear with carbolized water. He visited me once daily, stating that in syringing the water always passed freely into the throat. His general health has improved, but there are still slight signs of paresis of left facial nerve. February 25th called, complaining of no more communication with the throat. I found on probing that the fistulous opening was not closed, and bled easily. I cauterized its walls with chromic acid melted on the end of a probe. The following day communication was restored, and re-



mained thus until May 4th, when he presented himself with total paralysis of the left facial nerve. The discharge from the meatus is moderate and thick; in syringing the fluid passes freely into throat and nose.

*September 9th.*—The condition has not changed; same amount of discharge; the osseous portion of the meatus very much narrowed by collapse of its integuments; no granulations visible, and yet fluid does not pass into the throat in syringing. In October and November the only change was slight improvement in the facial paralysis. At times communication in syringing was very free; at times again there was none for several days, and without any visible cause.

*December 28th.*—Patient called; had purulent discharge copious. After syringing I found upper wall of meatus greatly bulging. At the fistula some granulations. After carefully drying, I detected a piece of loose necrosed bone; I tried to remove it, and succeeded in doing so with forceps and a sharp hook. Slight hemorrhage followed, which was easily checked by filling the meatus with cotton. After resting one half hour, hemorrhage having stopped, patient was requested to call the following day.

*December 29th.*—He pretends to feel clearer in his head than ever before (?). Discharge has decreased considerably. In injecting with ordinary syringe, as well as with Schwartz's middle-ear canula, the fluid passes freely into the throat. In probing no more rough denuded bone surface could be discovered. Patient will proceed with treatment.

*Jan. 30, 1887.*—The discharge continues. On probing fistula I detected another small sequestrum; patient felt dizzy, I therefore stopped all manipulations.

*Feb. 21st.*—Patient came stating that he was not able to force the water through in syringing, that the discharge had disappeared and he felt well. I found no discharge in meatus, but at the fistula a hard-appearing substance which I thought was a dry scab; I tried with the probe to remove it, but, finding it was hard, I removed it with the forceps, and found it to be the cochlea. Patient felt very well. As no discharge made its appearance after this sequestrum was removed, it may be admitted that this is perhaps the end of the suppurative process, and that it will heal up. The facial paralysis has improved wonderfully. Advised to continue syringing the ear, which he did for two or three weeks longer. He is perfectly well now.

**CASE 10.—Chronic Otorrhœa of Right Side, with Total Paralysis of Right Facial Nerve; Caries of Mastoid with Spontaneous Perforation; Operation, with Relief; Death after a Second Operation.**

Child  $2\frac{1}{2}$  years old, I saw first in consultation with Dr. Morse in his office in April, 1886. The child had been strong and perfectly healthy when, from unknown cause, he became affected with a purulent discharge from right ear. This was neglected until the right side of the face became paralyzed and a swelling presented itself behind the ear. When we saw the poorly nourished child it had total paralysis of right facialis, very profuse, fetid, purulent otorrhœa; the skin covering the region of mastoid was dark-red, with two granulating fistulæ, from which a very offensive discharge oozed out. We decided to operate at once; the child being etherized, an incision was made through the thin cutis, which was totally undermined and underlined with fungous granulations. In the external plate a fistula was found at the level of the upper and 1 cm from posterior wall of the meatus; it was enlarged partly with chisel partly with scoops. The contents of mastoid, consisting of decayed tissue, cheesy substance, and granulations, were entirely removed. The fungous granulations covering the bone were scooped out, and a portion of the cutis was also removed. Very free communication existed in syringing. The child was then treated daily in my office for about eight weeks, when the soft integuments had perfectly healed, and the fistula kept open with a soft-rubber drain. The suppuration had considerably decreased, but was still profuse. No change had taken place in the facial paralysis. I had informed the mother that I intended to operate a second time, which probably discouraged her, for I never saw the child again.

A few weeks later I heard that the child had been operated on by a general physician, and died.

*(To be continued.)*

## REPORT ON THE OTOLOGICAL SECTION OF THE BRITISH MEDICAL ASSOCIATION IN 1888.<sup>1</sup>

THE annual meeting of the British Medical Association was held in Glasgow on August 8th, 9th, and 10th of this year, and its Otological Section furnished the first opportunity in Scotland for a gathering of otologists. Dr. Thomas Barr, of Glasgow, presided in the Otological Section, and the attendance of otologists was unusually large.

The subject of the presidential address was: "The Present Position of the British School of Aural Surgery, and the Influence it has Exerted upon the Progress of the Art, with a Few Suggestions as to how that Influence might be still further Increased." After referring to the progressive development of the knowledge of ear disease and the influence exercised upon this by British surgeons in the past, alluding to the work done by Archibald Clelland, Sir Astley Cooper, Joseph Toynbee, Yearsley, and Sir Wm. Wilde, the President pointed out the work done by present workers, especially in the operative treatment of the intracranial conditions dependent upon the diseases of the ear. "By the specially brilliant work done in the last direction, conditions which have always been regarded as the most hopelessly fatal of all the consequences of ear disease have been successfully dealt with—conditions in which, as the result of ear disease, collections of purulent matter have formed in the substance of the brain or just inside the skull. This is one of the most recent and striking developments of surgery. That it is not yet sufficiently known, even by specialists, is evidenced by the fact that I have searched in all the works on

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<sup>1</sup> Prepared in a condensed form by Dr. Barr, mainly from the more detailed and somewhat disjointed accounts which have already appeared in the *Brit. Med. Journ.*

aural surgery available, without finding, except in one instance, any reference to this operative treatment. That exception is in the latest edition of Dr. Roosa's American 'Treatise on Disease of the Ear,' where he says that, after much consideration, he would advise that, in all cases where death seems to be threatened from cerebral abscess, trephining should be carried out, and a thorough search made for pus in the interior of the cranium. Dr. Roosa has, however, no successful case to record. Even in the largest and most exhaustive work hitherto published on diseases of the ear, namely, that by Professor Adam Politzer, of Vienna, there is no reference whatever in the edition just published to the practicability of reaching and removing, by trephining the skull, purulent collections in the intracranial cavity. We are proud to be able to claim for this country the merit of demonstrating within the past two years that without any carious aperture or superficial swelling on the surface of the head to guide the surgeon as to the seat of the abscess, but simply and solely from the local and general symptoms manifested by the patient, a collection of matter in the brain or inside the skull may be diagnosed, reached, and drained with complete success. In this way a number of patients have been restored to health, even from the very jaws of death. Dr. Wm. Macewen, of this city, has operated in seven cases where he trephined and drained abscesses in the temporo-sphenoidal lobe, by which operation he has saved five lives. Mr. Barker, of London, has recorded two similarly successful cases. Mr. Caird, of Edinburgh, has also successfully operated once. Victor Horsley has likewise performed the operation once, with the result of saving the patient. All these, of course, were cases in which the abscesses were due to ear disease. You will, I trust, have the opportunity of seeing two of Dr. Macewen's cases; the one having been treated eighteen months ago, and the other three months ago. In one case operated upon by Dr. Macewen, while the results of the operation were entirely satisfactory, the patient, a little girl, died some time after from peritonitis, and I had the opportunity of seeing in the brain the cicatrix marking

the position of the abscess, which, after being drained, had entirely healed, leaving only the cicatrix behind. In this direction, gentlemen, I am convinced that a splendid field of usefulness lies before the surgeon who treats disease of the ear. Not only will it be possible to reach and drain abscesses in the temporo-sphenoidal lobe of the cerebrum, but it will also be possible to save life by opening into the cerebellar fossa, and removing pus from the neighbourhood of the lateral sinus. I believe it may even yet be within the possibilities of surgery to clear out septic thrombi from the interior of the lateral sinus (the formation of which is no doubt often a premonition of pus formation elsewhere) by ligature and removal of a portion of the sinus. The general surgeon has thus come to our aid, and it is for us now earnestly to coöperate with him, and to watch most carefully every case of purulent ear disease which may develop symptoms of extension to the interior of the cranium, and, without undue delay, to adopt those operative measures which, as experience has now so brilliantly proved, offer, in competent hands, a fair chance of success." Dr. Barr then went on to advocate the formation of a British Otological Society, making in this connection the suggestion that it would be well if there were an English editor of the *ARCHIVES OF OTOLOGY*, in the contributions to which it would also be very desirable that British otologists take a larger share. Dr. Barr finally urged that the examining boards should see to it that every student, before receiving the legal qualifications to practise medicine and surgery, should be competent to examine the ear intelligently and to deal with the important and common diseases of that organ.

Dr. Barr said in this connection: "A vast number of those who suffer from ear disease can never come under the direct treatment of surgeons specially devoted to the practice of aural surgery. It is therefore of the utmost importance to the community that every medical man, before entering upon practice, should be acquainted with the chief and most approved methods of examination and treatment, and should be familiar with the main pathological conditions affecting the organ of hearing. We cannot conceal



the fact that the great majority of men begin the practice of their profession with neither practical nor theoretical knowledge of the diseases of the ear, to the grievous injury of the public. Students have the impression, evidently justified by experience, that while they may have to undergo thorough examination in regard to their knowledge of the anatomy and physiology of the ear, it is superfluous, for the purpose of examination, to know any thing of the diseases of that organ. Most of us who undertake to lecture or give clinical instruction upon ear disease, know how this impression affects the numbers and regularity of attendance of those who come to our classes. If no change for the better ensues, large numbers of men will continue to enter upon the practice of the medical profession unable to cope with the simplest diseases of the ear, until either attendance upon a course of diseases of the ear is made compulsory, or until the medical examining boards decide that these diseases shall be no longer ignored in the professional examinations for degrees. I quite acknowledge the difficulties of the situation. I quite recognize that students are already overburdened with subjects of study and examinations, and that the licensing bodies are naturally unwilling to add still further to the burden. But if, on account of the shortness of the curriculum and of the magnitude of the work which has to be done, something must be omitted, I would submit that, in justice to the public, the omission should not be that of the knowledge and treatment of an important organ of the body. Will the public prefer that its doctors should have a knowledge, meagre as it usually is, of botany, zoölogy, or chemistry, if such knowledge is at the expense of their ability to treat diseases of the eye, the ear, or any other important organ of the body? If this matter were submitted to the public there can be no two opinions as to what the decision would be. That practitioners should possess this knowledge is now rendered all the more necessary by the improvements in the methods of treatment of recent years, and especially by the development of the operative treatment of the intracranial complications. These complications are, I am more and more con-



vinced, much more frequent than is generally supposed, and now that surgical treatment may save such patients, how supremely important it is that the general practitioner should promptly distinguish their true nature, and resort in time to the improved methods of surgery."

Three subjects were selected for formal discussion, namely: (1) The conditions calling for perforation of the mastoid portion of the temporal bone, and the best methods of operating. (2) Adenoid growths in the naso-pharynx; their influence on the middle ear and their treatment. (3) The true value of those aids to hearing usually termed "artificial tympanic membranes."

#### *1.—Operations on Mastoid.*

Dr. P. McBride opened the discussion on operations on the mastoid process. He first discussed the therapeutic value of incision of the soft parts down to the bone in mastoid inflammation before pus has formed. He believed that it was not a life-saving operation, but chiefly palliative of pain, and a means of exploring the conditions of the cortex. Incidentally Dr. McBride referred to the possibly bad effects of insufflation of powders in suppuration of the middle ear with small perforation of the membrane. He could not divest himself of the idea that in such cases mastoid inflammation sometimes results from pus retention due to these powders. In regard to the opening of the mastoid spaces, he would consider persistent pain, even although there were no swelling or redness over the surface, to be the main indication, along with symptoms of meningeal irritation, associated with middle-ear suppuration, and that the indication is commonly urgent just in proportion to the severity of the pain. In one case, after chiselling through bone of almost ivory consistence for nearly an inch, Dr. McBride found from the flow of dark venous blood that the lateral sinus was wounded, but the hemorrhage was easily checked by an application of lint dipped in carbolic acid.

This case did well even without any drainage from or opening into the mastoid antrum.

The operation should be performed as close to the meatus as possible, and by means of a hammer and gouge. Trephines and borers are hardly justifiable. Much dressing is avoided, and the wound is syringed with warm boracic-acid lotion every hour or two, the fluid being made to pass both from the meatus to the wound and *vice versa*. Dr. McBride suggested the use of the digestive ferments, as trypsin and papayotin, as a means of cleansing the recesses of the middle ear.

Dr. Stewart (Nottingham) said he should lay it down in a general way that, with local indications of pent-up secretions in the middle ear causing injury to the general health, and not yielding to other methods of treatment carefully carried out, the surgeon should penetrate the mastoid and establish a communication through the antrum mastoideum and the external meatus. The operations short of reaching the antrum, though in themselves frequently of great benefit, were of secondary importance. He had laid down rules for his own guidance for penetrating to the antrum mastoideum, and he hoped they would be found safe and reliable. If a line were drawn in the direction of the zygoma, and exactly coinciding with the osseous roof of the external meatus, and another downwards from that line at right angles to it, and exactly coinciding with the posterior osseous wall of the meatus, the posterior angle formed by these two lines would indicate the spot to be perforated. The perforation should be done as close up to these two lines as possible, but not beyond them. Let him compare these directions with other methods. The bony points being thus fixed upon, the incisions in the integuments should be guided accordingly. Bearing in mind the structures likely to be injured—lateral sinus, dura mater in the floor of the cranial fossa, facial nerve, and external semicircular canal,—he believed it possible for the surgeon who proceeded with due care to expose the dura mater without injuring it or without bad consequences to the patient. Beyond a fixed depth (five eighths of an inch) the surgeon should not go, and it was well known that in many skulls it would not be possible to bring the operation to a successful termination. The in-

struments that appeared to him to be the best were a trephine in preference to the chisel and mallet, sponges of two or three sizes, and a scoop. Dr. Stewart concluded by referring to some cases that had come under his own care.

Dr. Barr referred to the propriety of opening into the antrum for the cure of those cases of chronic suppurative inflammation of the middle ear which had resisted all other methods of treatment, where, in spite of long-continued and thorough cleansing and antiseptic treatment from the direction of the external auditory canal and Eustachian tube, the purulent discharge still continued and still emitted the odor of decomposition. By this means they might efficiently cleanse the cavities of the middle ear, and bring about an end to the secreting and decomposing process, and thus the removal of a serious menace to life itself. Dr. Barr believed that in this direction important work might be accomplished in the future. The desideratum was that an absolutely safe method of operation should be adopted. Dr. Barr did not think that operation by the mallet and chisel would insure the safety of the lateral sinus, if that sinus had an abnormally outer and anterior position. The blows of the mallet were very considerable, especially in cases where the symptoms pointed to the possibility of cerebral abscess or meningitis, while to use chisel and mallet at the bottom of a deep wound was often very difficult. A proper dental burr, propelled by a suitable mechanism, was probably the safest instrument, was much easier than the chisel and mallet, and had not the dangerous points of the ordinary drill or trephine.

Dr. Laurence Turnbull (Philadelphia) was of opinion that we were apt to neglect the importance of constitutional treatment in mastoid disease, such as diet, rest, use of antipyrin, aconite, iron, and iodine, and above all, the relief of pain by morphine and atropine. Polypoid growths in a large majority of old cases should be removed, for dead bone was so often found under them. In illustration of this subject, Dr. Turnbull reported cases in which he had removed sequestra of bone from the mastoid and labyrinth, which had been covered up by the polypoid growths. He also gave

an account of a case of temporary insanity following mastoid disease, in a man, where there was a hard, almost ivory-like condition of the bone, which he removed, but did not enter the antrum, and by the operation and constitutional treatment the case recovered.

Dr. Lewis (Birmingham) said cerebral abscess following suppuration of the middle ear was more frequently met with than was generally supposed. Five cases of death from this cause had come under his notice in five years; in two cases a post-mortem examination was made, when in one a large quantity of pus was found in the temporo-sphenoidal fossa; the other case died from phlebitis of the lateral sinus. Two declined treatment, but the third, who suffered from old mastoid trouble, died, he was told, from symptoms of cerebral disease. Pain was not always to be the guiding condition that demanded either trephining the mastoid or skull, for a case came under his notice where most violent pain lasted for a considerable time. All operative treatment was deferred, and the ice-bag being applied for weeks, the patient made an apparent recovery. When, after cutting down upon the mastoid, caries was found, he thought the mastoid should then be drilled, and, in one case, not having a drill at hand, he had used a gimlet with satisfactory result.

Dr. Walton Browne (Belfast) referred to cases of caries of the mastoid process, and advocated free drainage by suction and passing a drainage tube through the mastoid process to the external meatus. He detailed two cases of abscess of the brain treated by trephining; one of these recovered. Dr. Browne did not approve of a drainage tube in case of abscess of brain, and thought trouble was produced by it and washing out the abscess cavity. He would advocate simply trephining, opening the abscess, and allowing it to drain away.

Dr. Farquhar Matheson spoke of the frequency of mastoid inflammation, and concurred in the classification of dividing this condition into two classes, namely, periostitis of the mastoid, and otitis of the whole bone. The first class was by far the most important, and occurred, as a rule, in chil-

dren and in young persons. This condition readily yielded to treatment. In the first outset leeches and fomentation were all that was required. This failing, incision through all the structures down to the bone must be made, followed by drainage. In otitis, occurring oftenest in adult and old age, the trephine must be used to open the mastoid cells.

Mr. James Black expressed pleasure at two points brought out by Dr. McBride, namely: (1) the risk of retention of inflammatory products due to blocking of the auditory passage by caking of a pack of boracic acid in the "dry method" of treating an otorrhœa, and the caution of vigilant attention of the aurist when this treatment was adopted; and (2) the importance of pain and facial paralysis, with recurrence of granulation polypus after removal, as an urgent reason why perforation of the mastoid should be performed. Mr. Black showed a skull on which it would be quite impossible to have performed the operation on the plan often recommended, namely, a perforation of the bone half an inch behind and the same distance above the centre of the meatus, without penetrating the wall of the lateral sinus. The perforator or drill was advocated as dispensing with the jarring effect by which the use of the mallet and gouge was of necessity accompanied; but the only sure way of avoiding the lateral sinus was to hug the upper and posterior wall of the external auditory meatus.

Dr. Charles Warden said that with regard to the use of dry powders, boracic acid, etc., and packing therewith, the difficulty was that one was not able to see the patients often enough, in which case the powder was left from day to day, not acting as an absorbent, but as a direct plug, which he considered most dangerous, as it simply locked a discharge of matter which should have a free exit. His preference was for boracic-acid solution, zinc and carbolic, etc.

Dr. McBride, in reply said that in spite of what had been said he must adhere to his views as to the advantages of the chisel. The objections as to doing harm by concussion were purely theoretical. The difficulties of diagnosing intracranial lesions, both as to their commencement and as to their nature, were touched upon. As to constitutional treatment,



he failed to see how it could do more than palliate; it could not produce drainage. Dr. McBride could not agree with the President's suggestion as to mastoid opening in cases of perforation of the membrana flaccida, as in such cases the suppurating cavity was often shut off from the tympanum, and could not be reached by through-irrigation.

2.—*Adenoid Growths in the Naso-Pharynx—Their Influence on the Middle Ear and Their Treatment.*

Dr. Lennox Browne opened the discussion. He referred to the relation of adenoid growths to enlarged tonsils. Those growths often existed when the tonsils were not enlarged, but they also frequently existed with enlarged tonsils, and the removal of the latter failed to remove the deafness because of the presence of the adenoid vegetations in the vault of the pharynx. It is important that these growths should be looked for in suppurative diseases of the ear, as well as non-suppurative cases. Dr. Browne advocated strongly the use of the finger-nail as the most efficient method of removing them. In regard to anæsthetics, if the operation of removing the growths with the finger-nail be adopted, they may be thoroughly cleared out of the naso-pharynx by an introduction of the finger; if a second operation is required, which should be rare, it will usually be necessary in the case of a child to administer chloroform. Dr. Browne thought it probable that the hypertrophic middle-ear catarrh of the adult may sometimes be based upon the thickening of the submucous tissue of the naso-pharynx, induced by the adenoid growths of childhood, and a limited experience warranted further trial of the process of scraping the post-nasal space when there was thickening without actual out-growth, as an aid to the resolution of an adult hypertrophic middle-ear catarrh.

The following papers connected with this discussion were also read. Dr. Hill on "The Rôle of the Pharyngeal Tonsil in Health and Disease," in which he advanced the view that its function is analogous to that of an ordinary lymphatic gland, namely, the production of leucocytes for the blood, hence pathological conditions in this structure are associated with



strumous states of the system. Dr. Adolph Bronner, of Bradford, read a paper in which he stated that he found 8 per cent. of 250 school children suffering from symptoms of adenoid growths. Of 152 cases of adenoid growths, 85 per cent. showed symptoms of past or present affections of the middle ear. He believed the best method of removal was by Hartmann's curette.

Dr. Farquhar Matheson, of London, also read a paper on "The Etiology of Stammering, Stuttering, and Other Impediments of Speech," in which he attributed a large majority of these distressing speech defects in early life to diseases of the nose and naso-pharynx. The author explained that acute and chronic rhinitis and pharyngitis, inflammation and enlargements of the middle and superior turbinated bodies, produced by reflex-action spasmodic and irregular action of the muscles concerned in phonation and articulation, thus constituting, through force of habit, stammering and stuttering. Adenoid vegetations in the naso-pharynx, which was stated to be the most frequent cause of speech impediment, acted partly on the same reflex principle and partly by mechanical interference with the movements of the soft palate and fauces, and also with the free passage of air during speech through the nasal and pharyngeal cavities.

The details of several cases of stammering were given, where, after careful treatment of the various diseased conditions of the nose and naso-pharynx, the speech impediment was perfectly cured or greatly improved. The result of examination of the nose and naso-pharynx of sixty cases of stammerers and stutterers of varying ages was given. The clearest evidence existed, it was stated, that each of these, either at the time of examination or at some former period of their clinical history, suffered from some form of disease of the nose or naso-pharynx. Further experience was, however, necessary to establish the correctness of the theory of stammering, etc., now advanced for the first time.

In the discussion which followed these preliminary papers, Dr. McKenzie Johnston said there could be no doubt that, if treatment of these growths were neglected, it

would be impossible to cure either cases of middle-ear catarrh or of suppurative disease. The middle ear is drained by the Eustachian canal; and, therefore, if these growths prevented the proper draining of the cavity, they failed to get one of the most important conditions—dryness and cleanliness—for the treatment of diseases of the ear. The effects of these growths on the general health were sufficiently serious to require careful consideration, but these hardly came under the subject of discussion. In conclusion, he expressed a decided preference for the forceps in place of the finger-nail, so much lauded by Mr. Lennox Browne.

Dr. Howard said that, while quite alive to the dangers in using anæsthetics in operation on the naso-pharynx, he always used chloroform, and thought that with precautions against the flow of blood into the larynx, the danger could be reduced to a minimum. He especially emphasized the importance of drawing forward the head in introducing the finger, so as to relax the soft palate and give the maximum of space, and, secondly, throwing the head back and downwards over the edge of the table when the patient was under chloroform and the blood began to flow, the position of the head making it impossible for the blood to get into the larynx.

Dr. Laurence Turnbull (Philadelphia) was glad to have the opinion of Dr. Howard in reference to the danger in the use of chloroform in so comparatively trifling an operation, and the discussion bringing forth the information of the death of two individuals from this cause. He was of the opinion, and had so expressed it in his "*Manual of Anæsthetics*," that, in such a class of operations systematic anæsthetics were not necessary, and should not be employed when they had such an admirable local anæsthetic as the hydrochlorate of cocaine. He has found that all operations on the nose or throat could be successfully performed with a 2- or 4-per-cent. solution of cocaine; the cocaine was best dissolved in a 1-per-cent. watery solution of pure crystallized carbolic acid, which assisted the action of cocaine and prevented nervous symptoms.

Dr. Charles Denison (Denver, Colorado) answered an inquiry, made by Mr. Lennox Browne, as to the frequency of these post-nasal adenoid growths in his section of country. In so far as his experience went, he could not say that either these growths or enlargements of glands generally were so frequently met with in the clear, dry atmosphere of Colorado as in sections bordering on the ocean.

Dr. Waxham (Chicago) simply agreed with Dr. Turnbull that adenoid growths were comparatively rare in America. His experience had been that the obstruction in the post-nasal space which was frequently met with was due to hypertrophy of the mucous membrane and of the pharyngeal tonsil rather than to adenoid growths.

Mr. James Black believed the natural finger-nail, when well developed, was the best instrument, because it was in close contiguity to a tactile organ; but still, the fact of some men, that is, Dr. Bronner, discarding the finger-nail in favor of the curette, seemed to show that in certain cases some other instrument was necessary. In most cases, however, the natural or artificial nail was necessary to complete the operation after another instrument has been used for the removal of the adenoid growths in the naso-pharynx, and the reason why was, that the choanæ were often blocked by the thickening of the mucous membrane around these openings, and it was his (Mr. Black's) opinion that the only safe way to remove this thickening was by the use of the nail.

Dr. Farquhar Matheson said that the removal with the finger-nail was preferable to the use of any instrument. An anæsthetic ought to be carefully administered, and a weak alkaline solution for nasal injection to be continued for some weeks after.

Dr. Walter Wolston (Edinburgh) said that a very large percentage of the deafness now existing in Great Britain—his experience would venture to say above 75 per cent.—was due to the presence of adenoid vegetations in the naso-pharynx. He used Loewenberg's forceps to clear the larger masses, and then, with the finger-nail, completely scraped out the channel, vault, and pharynx, and various crypts and

recesses of the post-nasal space, paying particular attention to the little cushion that almost always lay just above and pressed on the extremities of the Eustachian tubes. The finger-nail alone would not suffice in all cases, as in those above seven years of age the growths, often of a fibrous character, which sprang from the posterior wall of the pharynx, were so embedded in the normal tissues that a considerable amount of a cutting wrench with the forceps was necessary. It was well to reduce the posterior turbinated bodies if they were very large, and this he did by the galvano-cautery loop passed through the anterior nares.

Dr. Barr (the President) thought the men who brought the subject before the profession, such as Meyer, Guye, and Loewenberg, had performed a most important service to aural surgery; indeed, the discovery of these growths as sources of ear disease marked an important epoch in the development of the knowledge of ear disease. There was no doubt that these growths were very frequently met with in Scotland, and were most important causes of ear disease.

In their operative treatment Dr. Barr employed finger-nail, artificial steel nail, and Loewenberg's forceps, or modifications of them. He preferred, as a rule, the steel nail and the forceps, to the finger-nail. The latter was not sufficient to remove the tough growths, and was not so cleanly a method as instruments. Dr. Barr frequently employed first the forceps and then finished with the artificial nail. The introduction of proper forceps into the naso-pharynx was less painful than the finger, but the sensitiveness varied very much in different persons. Local application of cocaine was very useful, but it was well to avoid chloroform, although in very nervous children this anæsthetic was necessary. If chloroform was employed, the head should be placed well down, so as to avert the possibility of blood entering the windpipe. One operation was not usually sufficient to completely clear out the vegetations, and three or four might be necessary before a smooth condition of the mucous membrane and a permeable state of the nasal channels were secured.

Mr. Lennox Browne, in reply, referring first to the ques-

tion of anæsthesia, repeated that if operation were done at the time of first examination, no anæsthetic was required. Although the effect of introducing the finger into the nasopharyngeal vault was disagreeable, and, in young children, somewhat terrifying, it was by no means really painful, and local anæsthesia by means of a cocaine spray of 10-per-cent. strength was quite sufficient to annul all sensation. Although he preferred the finger-nail for removal of these growths, and had never found a case in which it could not be employed with success, he desired to accord the greatest liberty of action to every one on this point. The important thing was not what instrument was used, but how to attain a good result; and, personally, he very rarely found it necessary to repeat an operation by his method, while three or four repetitions of procedure by forceps had been admitted by various speakers.

3.—*The True Value of Those Aids to Hearing Usually Termed "Artificial Tympanic Membranes."*

Dr. W. Laidlaw Purves introduced the discussion. He said that the artificial drumhead acts as a protector, as a vehicle for medicaments, as an absorbent, as a moistener; but it is preëminently as a tension transposer and an assistant to the intratympanic muscles that it effects the changes which delight both patient and practitioner. The artificial membrane does for the ear what the artificial lens does for the eye, performing the work which the muscles themselves cannot do without a strain, so that those wonderfully minute variations necessary for conversational hearing may be effected with comfort.

In connection with this discussion Dr. Laurence Turnbull, of Philadelphia, next read a paper in which the following conclusions were expressed: 1. That such aids were important to the health of the ear, by preventing dryness and the general danger to the hearing, from the want of the protecting power of the natural membrane. 2. A certain degree of hearing would be possible without the membrana tympani, but perfect hearing was impossible without it. 3. In the various agencies which had been employed they had



not only the means of protecting and preventing drying effects of the air, but also the prevention of the passage into the middle ear of injurious foreign agents, the prevention of disease from cold air or water, so apt to set up acute inflammation, followed by abscess in the mastoid or brain. Satisfactory results had been obtained from the cotton ball or pellets of "Yearsley." The objection to this was the tendency which the ordinary cotton had to cause irritation, by bearing in its fibres bacteria and micrococci, also other foreign matters. Again, it sometimes fitted so closely, owing to discharge or mucus on its surface, as to make a shut sac, and absolutely prevent the vibrations of the membrane, thus acting as a damper. These difficulties were overcome by employing corrosive-sublimate solutions with "sublimate cotton," or a disc of sublimate gauze, moistened with fluid cosmoline, so as to make it more adhesive. When water with glycerine was employed, the mixture would soon ferment in the ear and become irritating and cause inflammation. By treatment they could much sooner employ the artificial membrane, even when there was a slight suppuration going on. The solution of the sublimate should not exceed in strength 1 to 4,000; if stronger it gave pain. The fluid cosmoline, or vaseline, was to moisten the pellet when about to be introduced, if the parts were dry. The pellets were placed in position by means of ordinary tweezers; the thread must be cut off close, so as not to be seen. He had discarded all the forms of apparatus which had any metallic spring, handle, etc., having found them always irritating and injurious.

As bearing on this subject Dr. Ellis (Newcastle) read a paper on the "Fraudulent Treatment of the Deaf by Impositors." Dr. Ellis showed artificial drums, brought to him by a workingman, and for which he paid £2 17s. 6d., which he stated he could very badly afford at the time, but which he was induced to send by the positive promises of cure held forth. He (Mr. Ellis) had had the metallic portion of these drums examined by a goldsmith, and he pronounced them "brass"—which he thought they would agree with him was a most appropriate metal. The poor man who was induced



to purchase these drums suffered from nervous deafness and tinnitus, and had nothing whatever the matter with his tympanum, or conducting apparatus, and Mr. Ellis purposely avoided entering into the question of the applicability of the artificial tympanum, but from the various impositions practised under its cover, he was sometimes inclined to ask, was the artificial tympanum a blessing or a curse? Might they not, failing to cure some of these patients, at least endeavor to save them from imposition and fraud by exposing the nefarious schemers who lay in wait for them?

Dr. Matheson said that the most useful form of artificial membrane was the cotton-wool plug (antiseptic) and a covering or plug of boric acid. All discs of tissue of whatever variety act as irritants, and should be used with much caution.

Dr. Donald Stewart said the difficulty of deciding whether the artificial membrane was a means of avoiding dampness of the membrane, or a means of introducing the necessary moisture, was an important point. In health the membrane was quite dry, and they had thus a pregnant hint to take care not to overtreat these cases. Dr. Warden said his preference was for Field's drums or a modification of Toynbee's or Yearsley's.

Mr. Richard Ellis had not found the artificial tympanum of much use in hospital practice, but in a number of cases in private practice it was undoubtedly serviceable.

Dr. Walker Downie was in the habit, after all suppuration had ceased, of using a layer of cotton-wool firmly compressed between finger and thumb, and applied by a pair of fine forceps; these could afterwards be readily applied by the patient himself. Should this not succeed, he frequently used Field's pattern. Lately he had, partly as an experiment, been applying a small circular patch of pellicle of egg; which was soft and lay firmly in contact with the membrane.

Dr. James Erskine had found Professor Lucae's artificial tympanic membrane very useful. It had the advantage of being very easily inserted, and no injury could happen to the meatus in its introduction. He had come to the

conclusion that the cotton-wool pellet of Yearsley's invention was the best artificial drum-membrane.

Dr. J. Macfie said that we need not expect to find one form of artificial drumhead applicable to all cases amenable to improvement by this treatment, the former varying with the case, but he thought the most generally applicable was Yearsley's cotton plug, or some modification of it.

Dr. Barr (the President) said the cotton pellet was, on the whole, the best form of artificial tympanic membrane. The india-rubber disc was, however, occasionally though rarely more efficient. As usually sold by the instrument maker it was very defective, as from the mode of connection of the disc with the stem a hard metal knob pressed upon the tympanic structures. Before employing this aid to hearing the purulent secreting process, if present, should be cured, or should be reduced to a very small compass; and great care should be taken at first that it should remain in the ear only for a short time, not more than two or three hours; otherwise a fresh purulent process might be excited, which would greatly discourage the patient. It should rarely remain in the ear during the sleeping hours. Before deciding as to the value of this remedy in any given case, we must take great pains to try more than once various sizes and shapes in various positions. He believed that many failures were accounted for by the want of sufficiently painstaking efforts in those directions. A certain degree of pressure was usually necessary before the good effect was achieved, and while the postero-superior quadrant was usually the best position, trial should be made over the short process of the malleus, and indeed on any part of the upper regions of the tympanum. The pellet should be moistened, preferably by some thickish antiseptic fluid. In some cases where the cotton pellet or disc was apt to become misplaced, falling out from its proper position, it was a good thing to immerse the cotton in collodion and apply it to the part. In this case, if the ear could bear prolonged contact, it need not be removed for days or weeks. He knew a patient who kept it in the ear day and night for months when the collodion was applied. Dr. Barr expressed the opinion that the so-

called "ear-drums," so extensively advertised in the newspapers, and which consisted of a piece of india-rubber attached to a metallic stem, were frequently highly injurious to persons with defective hearing, that the number of deaf persons who might be benefited by this form was comparatively small, and that in no case should an artificial drum of any form be used until a surgeon had examined the defective ear and ascertained if the case was suitable, for if not suitable their introduction into the ear was not merely valueless but decidedly injurious.

The view was expressed by several members of the section that this expression of opinion by the President regarding the "ear-drums," as commonly advertised, should be sent to the Glasgow newspapers for insertion. The secretaries were requested to carry this out.

In addition to these formal subjects of discussion the following other communications were made to the Section.

Dr. Barr (President) showed two cases which had been operated upon by Dr. Macewen for cerebral abscess due to ear disease. The first has been already described in the *ARCHIVES OF OTOTOLOGY* (vol. xvi., p. 146). The second case was that of a young man, aged twenty-one, who was operated upon on the 15th of May last. There had been a discharge from the left ear for eight or nine years. For three weeks before the operation the symptoms were headache, vomiting, slow and intermittent pulse, normal or sub-normal temperature, contraction of left pupil, paresis of all the ocular muscles, with exception of the external rectus, partial facial paralysis on the opposite side, paresis of right arm, with wrist-drop. The mastoid was first trephined, so as to establish communication with the external auditory canal, but little or no pus was found there. Dr. Macewen then trephined above the external auditory canal, and pierced the brain tissue with a trocar. Three ounces of horribly foetid pus were removed. The cavity was syringed with a weak solution of carbolic acid. A chicken-bone drainage tube was inserted. The dressing was not removed for three weeks, when the wound was found to be almost healed. The patient recovered without a single bad symp-

tom. The opening was filled up with firm bone, and the patient was now perfectly well.

Dr. Charles Warden (Birmingham) related a case of congenital ear disease, producing mastoid abscess and facial paralysis. This was a child in whom a discharge from left ear was noticed shortly after birth, followed in a short time by convulsions, producing paralysis of the left side of face; soon after a large abscess formed at the back of the ear in the temporal and mastoid region; when opened diseased bone was evident. Several pieces of dead bone were subsequently removed from the meatus. Ultimately the facial paralysis completely passed off. Dr. Warden was of opinion that a low form of inflammation had been going on from birth.

Dr. Christopher Lewis (Birmingham) recorded a case of deep cellulitis of the neck, with partial paralysis of right arm, following acute otitis media caused by a blow. A boy, fourteen years of age, fourteen days after a blow on the ear, was seized with pain in ear and head, vomiting, delirium, and high temperature. About the ninth or tenth day swelling and redness appeared over the apex of mastoid, followed by deep-seated inflammation of neck. The membrane had a boggy appearance, but there was no perforation, but marked deafness. An enormous swelling, as hard as a board, developed in the neck. There were no rigors, but there was intense pain. Some difficulty of movement was noticed in the right arm owing to the injury received by the cervical plexus. An incision was made a few inches above the clavicle, and a grooved probe introduced, which first came upon a caseous mass, and then there was a discharge of pus. From this time the symptoms steadily subsided. The recovery has been complete, and the hearing has become normal. The probability is that suppuration in the mastoid cells first took place, the pus breaking through the inner surface of the apex, and thus underneath the sterno-mastoid muscle into the deep parts of the neck.

Dr. J. Erskine showed: (1) sequestra of portions of labyrinth from a woman who suffered from a discharge from right ear for four years. There were facial paralysis of the

same side and total deafness. The sequestra included portions of cochlea, portion of inner wall of tympanum, and incus. (2) An unusually large auricular appendage. This was a projection in front of the right ear of a woman aged twenty-nine. The base of the projection measured half an inch, and its length over an inch. Under chloroform it was removed by one snip of the scissors.

## REPORT ON THE PROGRESS OF OTOTOLOGY DURING THE FIRST HALF OF THE YEAR 1888.

### I.—NORMAL AND PATHOLOGICAL ANATOMY, HISTOLOGY, AND PHYSIOLOGY OF THE EAR AND NASOPHARYNGEAL CAVITY.

By A. BARTH, BERLIN.

Translated by Dr. MAX TOEPLITZ, New York.

#### A.—ANATOMY.

##### a.—HEARING ORGAN.

1. GRADENIGO, GIUSEPPE, Padua. The development of the auricle with reference to its morphology and teratology. Preliminary communication. Reprint from the *Centralbl. f. d. med. Wissensch.*, 1888, Nos. 5 and 6.

2. IMADA, TSUKANU. Location of the inner ear. Communications from the medic. faculty of the Imper. Japan. University of Tokio. Vol. i., 3, (*Rev. Centralbl. f. klin. Med.*, 1888, p. 219).

3. Prof. Dr. RÜDINGER. The efferent canals of the endolymph of the inner ear. Lecture, delivered before the Society of Morphology and Physiology, at Munich, December 6, 1887. *Münchener Med. Wochenschr.*, 1888, p. 139. The paper will appear in the *Sitzungsber. d. mathem.-physical. Cl. d. k. b. Akad. d. Wissensch.*, 1887, No. 3. With 3 plates.

4. Prof. Dr. RÜDINGER. Contribution to the anatomy and development of the inner ear. With 3 colored double plates. *Monatsschr. f. Ohrenheilk.*, etc., 1888, Nos. 1, 2, and 3.

5. HABERMANN, J. New contributions to the pathological anatomy of tuberculosis of the hearing organ. From Prof. CHIARI's Pathologico-Anatomical Institute at the German University in



Prague. Reprint from the *Zeitschr. f. Heilk.*, vol. ix., pp. 131-161.

1. The auricle of man and of the higher mammals originated in two embryologically and morphologically different systems, viz., the colliculi branchiales externi (Moldenhauer), which form the margin and the immediate surroundings of the external auditory meatus, and a structure near the colliculi, which forms the auricle proper. The helix hyoidalis and the helix mandibularis enter early in a variety of relations to each other, by which the different parts of the auricle are formed. The separation of both systems, viz., the auricle proper and the external auditory meatus, does no longer exist in man, but is still well marked in several mammals. Traces of the first epidermoidal branchial pouch are found in many mammals, but in man only in teratomata.

2. IMADA describes a method of easily denuding the inner ear for the purpose of anatomical examination, and discusses its location in the skull.

3. At the saccus endolymphaticus there are small accessory canals of different length, which, in mammals and in man, issue from various points of the wall of its fundus, and then, divided into several branches, extend to the subdural lymph spaces of the dura mater. They are considered as efferent canals of the endolymph of the membranous labyrinth and as homologues of the ducts and sacculi, which occur in various forms and sizes in fishes, batrachia, reptiles, and especially in many lizards. It is embryologically proven that the saccus endolymphaticus does not end blind, even in higher animals, by the facts that the recessus labyrinthi, in which the saccus endolymphaticus originates, passes beyond the border of this sac in the form of tubes, and that it borders immediately upon and continues directly into the lymph-paths by means of epithelial fissures and also larger spaces. This relation is of physiological and morphological significance.

4. The examinations aim at an exact knowledge of the first formation and development of the ductus endolymphaticus, the sacculi, and the membranous semicircular canals, the origin of the perilymphatic spaces, and the development of the gelatinous stroma, the labyrinthian periosteum, and the regressive metamorphosis of the gelatinous tissue, and finally that of the parts fixing the membranous labyrinth in mammals; but the author appears principally to emphasize his right of priority with reference to the discovery of the parietal location of the labyrinth. The ductus

endolymphaticus is formed at an early period, and is imbedded into the dura mater of the posterior cranial fossa, which appears later and forms connections with the lymph-paths. The endolymph sac is originally connected with both vestibular sacculi by means of a simple opening, which is gradually prolonged into small canals. The endolymph sac is at some points limited by rather large veins, near which the opening of the ductus perilymphaticus is found. The endolymph sac represents an elastic pouch, by means of which the differences of pressure in the labyrinth can be equalized, and it forms, by means of the tubes communicating with the subdural spaces, an efflux of the constantly reforming endolymph.

5. The author adds four cases of tuberculosis of the hearing organ to the five cases published before. Since the first<sup>1</sup> of these papers, which are worthy of being read, has not been reviewed in these ARCHIVES, we shall here give a general review of all nine hearing organs, in which the histological examination reveals tuberculous changes. The patients were from 1½ to 40 years old. Tuberculosis of the lungs and of the digestive tractus was found in all cases, in some still other affections. There existed in two cases a tubercular affection of the naso-pharyngeal cavity; in two cases an acute tuberculosis of the tympanum with diffuse infiltration of the mucous membrane, very numerous tubercle bacilli, scattered giant-cells and miliary tubercles and superficial ulcers produced by the desintegration of the latter; in one case more extensive destructions caused by the cheesy degeneration of the diseased tissues with a few bacilli and giant-cells; in three cases numerous miliary tubercles with well-developed giant-cells and a few bacilli. At some points of the bone, especially on the ossicles, around the windows and the Fallopian canal, superficial caries was just beginning. Deep ulcers were found in the mucous membrane upon the promontory and around the stirrup, whilst the bulging of the posterior half of the tympanum and that of the inner and posterior walls were scarcely affected. In the latter cases more chronic forms of tuberculosis of the middle ear were concerned. The drum-membrane was affected only at its lower periphery and at the folds and pouches around the ossicles. There existed in six cases cheesy masses and miliary tubercles in the mastoid antrum, in three of which the bone was found diseased. The osseous tube is frequently involved in the tubercular

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<sup>1</sup> *Zeitschr. f. Heilk.*, vol. vi.

affection, the cartilaginous more rarely. In three cases tuberculosis had passed from the tympanum into the labyrinth. Here also there may be a tendency to recovery, viz.: granulation, formation of connective tissue, ossification, and also cicatrization. In one case the affection had extended from the inner ear through the aquæductus vestibuli. The affection does not appear to extend readily through the cochlear nerve into the cranial cavity, since in one case of extensive disease of the cochlea the nerve trunk was still intact. In six cases the facial nerve was more or less affected. Beginning formation of cholesteatoma was also found. The author insists, on account of a number of already mentioned and plausible reasons, upon his former opinion, that tuberculosis invades the tympanum in most cases through the tube and not through the circulation. The reviewer is enabled to add, that the same view of the acute diphtheritic affection of the middle ear, especially when the drum-membrane is intact, will find still less contradiction, but that the changes in the cartilaginous tube, when compared with those of the osseous, are remarkably slight, as it is proven by the autopsies.

D.—NASO-PHARYNGEAL CAVITY.

1. Prof. Dr. JULIUS ARNOLD, Heidelberg. On hairy polypi of the pharyngo-oral cavity and their relation to the teratomata. With three illustrations. Reprint from *Virchow's Archiv*, vol. cxi., 1888.

1. After a literary review of similar cases, published up to date, the author describes a tumor, which had been removed from a girl 13 years of age. As much as can be learned from the history it was congenital. It was attached by a pedicle to the posterior wall of the soft palate, somewhat to the left of the middle line, at about an equal distance from the free border of the velum and the lower margin of the left choana. It was readily removed by means of the galvano-caustic snare. The specimen, hardened in alcohol, is 27 mm long, 8 mm in diameter at the pedicle and 16 mm at the top. It has a cutis-like covering, with numerous pit-like impressions and lanugo-hairs. It consists principally of adipose tissue in which a small cartilaginous plate is imbedded. The microscopical examination reveals neither remarkable changes in the epidermis nor in the rete, but shows lack of sudoriferous glands. Between the groups of fat cells, tracts of bundles of connective tissue and elastic fibres are found; besides, vessels and

near them nerve bundles and striated muscular fibres. The small plate of elastic cartilage has a perichondrium.

In classifying these tumors the question arises whether they are rudimentary portions of another individual or separations of tissue from the same individual. ARNOLD inclines to the latter view, and therefore accepts them as teratomata only in this enlarged sense. In order to avoid errors, he calls the tumors arising from the same individual autochthonous teratomata, but heterochthonous teratomata those which, with reference to the presence of foetal organs, should be supposed to originate from a second, *i. e.* other germ.

#### B.—PHYSIOLOGY AND PHYSICS.

##### a.—HEARING ORGAN.

1. JACOBSON, L. Assistant at the aural-clinic of the University of Berlin. On hearing tests and a new method of exact determination of the acoustic threshold excitation by the aid of electrical currents. 1 plate. Reprint from the *Arch. f. Anat. u. Physiol.* (physiol. Abtheil.), 1888, pp. 189-212.

2. URBANTSCHITSCH, VICTOR, Vienna. On the influence of one sensory stimulus upon other sensory perceptions. Reprint from the *Arch. f. d. ges. Physiol.*, vol. xlii., p. 154.

3. ENGELMANN, T. W. On the function of otoliths. *Zoolog. Anzeiger*, vol. x., No. 258 (*Rev. Centralbl. f. Physiol.*, 1888, p. 677).

4. ARNHEIM, F. Contributions to the theory of the localization of perceptions of sound in the semicircular canals. Published by H. Pohle, Jena.

5. GELLÉ. The physiological significance of the semicircular canals. Transact. of the Acad. de méd., Paris, 1887 (*Rev. Allgem. med. Centralz.*, 1888, p. 212).

6. ROGDESTWENSKY, J. On the localization of perceptions of hearing. St. Petersburg, 1887. Dissertation. (Rev. in the *Centralbl. f. Physiol.*, vol. i., p. 721.)

7. GELLÉ. Réflexes auriculaires. Conservation du réflexe d'accommodation binauriculaire dans un cas d'hémianesthésie de la peau et des sens. *Compt. rend. de la soc. de biol.*, 1887, p. 395 (*Rev. Centralbl. f. Physiol.*, 1888, p. 677).

8. DOUMER, E. Étude du timbre des sons par la méthode des flammes mano-métriques. *Compt. rend. de l'acad. d. soc.*, vol. cv., p. 222.

9. VIOLLE, M. M. I., and VAUTIER, TH. Sur la vitesse de la propagation du son. Communication by M. MASCAT. *Compt. rend. de l'acad. d. sc.*, vol. cv., p. 1003.

1. JACOBSON, after many critical remarks, arrives, owing to his adoption of suppositions, which are wholly false, at his ideal, a mathematical formula, which shows that the acuteness of hearing is indirectly proportional to the square of that resistance in the rheostat, which inserted into the secondary closure is just sufficient to produce the threshold excitation of a given tone. The apparatus is, as much as can be seen from the drawing and description, useful for certain limited scientific investigations, but decidedly not for practical purposes of the aurist.

2. URBANTSCHITSCH considers the extensively described statements as physiological mutual actions between the different sensory perceptions, and explains thereby the appearance of photisms in sounds. He is struck only by the fact that certain sounds produce in some individuals also the appearance of only certain colors.

3. In ctenophores the spherical otolith rests in the aboral part of the animal on four equal, elastic, ciliated small plates in such a manner as to oscillate freely in every direction on the four plates in the midst of the bell. Every deviation of the main axis from the perpendicular position is followed therefore by a change of the pressure upon the supporting plates, which give rise to a compensatory reflex movement of the body. The small stones, which certain crabs place into their "hearing vesicle," most likely serve the same purpose.

5. The disturbances which are produced by the lesion of the semicircular canals are not transmitted by the cochlear nerve, but by the ampullar nerves. The roots of the nerves can be traced according to the position of the semicircular canals in three directions: the first to the cerebellum, the seat of the equilibrium and the involuntary motory impulses; the second to the medulla oblongata, whereby it is connected with the centre of vomiting and with the trophic and the vaso-motory centres; the third to the cortex of the cerebrum, thus producing facial and "ideomotory" disturbances (dizziness, staggering, etc.). The author believes that the semicircular canals are concerned in the "binauricular synergy," but that they have nothing to do with the faculty of localization.

6. If the posterior surface of the auricle is covered with soft



rubber, the intensity and the perception of the direction of sounds coming from behind are diminished.

7. If in normal hearing organs air is inflated upon a drum-membrane by means of a rubber tube, the perception of sound is decreased in the other ear by reflex change of tension of the drum-membranes. This experiment succeeded also in a patient with hysterical hemianæsthesia and unilateral deafness. The reflex is therefore independent of the perception of sound. [Is hysterical deafness a proof of this fact? Rev.]

8. After having photographed Koenig's vibrating flames for the determination of the pitch of sound, the author now uses them for the examination of the *timbre*. The secondary elevations and the ratio between fundamental tone and over-tone are recognizable. The sensitiveness of the plate renders the production of even the highest musical tones possible.

9. The authors have examined the velocity of sound in a tube of 70 cm in diameter, and found that it decreases with the intensity. In the atmospheric air they found a velocity of 331.2 metres. The pitch of the tone has no influence upon the velocity of the sound. The movement of the undulation is independent of the vibrations which accompany it.

## II.—PATHOLOGY AND THERAPEUTICS.

By A. HARTMANN, BERLIN.

Translated by Dr. MAX TOEPLITZ, New York.

### a.—GENERAL LITERATURE.

1. SZENES, SIGISMUND, Budapest. Report of Prof. Dr. JULIUS BÖCKE's department for ear patients at the Rochus Hospital during the year 1887. *Arch. f. Ohrenheilk.*, vol. xxvi., p. 137.

2. Prof. K. BÜRKNER. Report on the cases observed from January 1, 1887, to March 31, 1888, at the polyclinic for ear patients at Göttingen. *Ibid.*, p. 235.

3. The Bradford Eye and Ear Hospital. Report for the year ending Dec. 31, 1887.

4. New York Eye and Ear Infirmary. The classification and treatment of over 2,000 consecutive cases of ear diseases at Dr. SEXTON'S aural clinic, 1886. Geo. S. Davis, Detroit, pp. 95.

5. PROUT, MATTHEWSON, and RUSHMORE. Brooklyn Eye and Ear Hospital; 19th annual report.



6. KIPP, C. J., and PARKIN, WM. Eighth annual report of the Newark Charitable Eye and Ear Infirmary, 1887.

7. St. Michael's Hospital, Newark, N. J. T. Y. SUTPHEN in charge of Eye and Ear Department, 1887.

8. EICHBAUM, Stettin. On subjective perceptions of hearing and their treatment. Heuser, publisher, 1888.

9. ALTHAUS, London. Contributions to the pathology and treatment of tinnitus. *Arch. f. klin. Med.*, vol. xlii., No. 5.

10. EITELBERG, A., Vienna. A case of periodically recurring aural hemorrhage, with imperforate membrana tympani. *Internat. klin. Rundschau*, 1888.

11. BAGINSKY, B. On aural affections in railway-spine. *Berliner klin. Wochenschr.*, No. 3, 1888.

12. RING, FRANK W. The disastrous results of a new artificial drum-membrane. *Med. Record*, June 30, 1888.

13. GELLÉ. Un cas d'allochirie auditive. *Gazette des Hopitaux*, No. 11, 1888.

14. KRETSCHMANN, F., Magdeburg. Antisepsis in otology. *Arch. f. Ohrenheilk.*, vol. xxvi.

1. In BOECKE's department for aural diseases, 1,572 patients were treated in the year mentioned.

2. The number of ear patients treated by BÜRKNER during the time mentioned was 1,428. The small amount of those "remaining uncured" (1.8 per cent.) calls forth admiration.

3. In the Bradford Eye and Ear Hospital, 20 patients were under treatment during the year 1887 for diseases of the auricle, 90 for those of the external meatus, 454 for the middle ear, the nose, and naso-pharynx; 35 for the inner ear, and 12 for the mastoid process.

4. This is a neatly printed and quite a valuable little brochure, containing as it does running observations on the diagnosis and treatment of all the diseases of the ear usually met with in a clinical practice. Dr. SEXTON's particular views on methods of practice which are now well known to the profession, are set forth with distinctness, and numerous instruments and appliances are figured. A nomenclature of ear diseases is appended, which, while it may not be satisfactory in all particulars, is still very suggestive and valuable.

SWAN M. BURNETT.

5. Total number of ear patients, 1,659; number of operations, 56; among which were 6 Wilde's incisions, 12 polypi removed, and 4 paracenteses of *Mt.*

SWAN M. BURNETT.

6. Number of ear diseases, 1,074 ; operations, 54 ; among them 1 perforation of mastoid, 8 polypi removed, and 25 paracenteses of drumhead.

SWAN M. BURNETT.

7. Number of ear cases, 409 ; operations, 39 ; among which were 1 for caries of mastoid, 2 Wilde's incisions, 9 for removal of polypi, 2 for removal of necrosed bone from external meatus, and 2 for removal of sequestrum of temporal bone.

SWAN M. BURNETT.

8. EICHBAUM's monograph (pp. 32) contains an enumeration of the various kinds of subjective noises, and of the views prevailing at present on their origin. His own experience refers only to galvanic treatment, which has yielded beneficial results. The anode, creeping in and out of the current, and a strength of the current of 0.25 to 0.5, never exceeding two milli-amperes, is principally employed.

9. ALTHAUS asserts that tinnitus aurium is always produced by pathological irritation of the acoustic nerve, whether the ear be locally diseased, or changes of pressure exist in the arteries, as in Bright's disease or in chlorosis. In intermittent noises, aneurisms of the carotis interna, of the basilaris, and meningeal media should be kept in mind, as compression of the carotis at the neck interrupts the noise, which can further be found by auscultation of the corresponding external meatus. In Ménière's disease, *i. e.*, hemorrhage into the membranous labyrinth, persistent tinnitus also exists ; furthermore, in affections of the labyrinth of specific origin, and finally as the medicinal effect of quinine, salicylic acid, etc. Tinnitus aurium may be observed as an initial symptom of certain cerebral diseases. Tinnitus represents here rather hyperæsthesia of the centres of hearing of the cerebral cortex, than that of the labyrinth with prevailing hallucinations. The presence of tinnitus in meningitis and epidemic cerebro-spinal meningitis is a known fact. The treatment should be causal, whereby galvanic treatment of the neurosis might afford more benefit than quinine, etc.

10. After some general remarks EITELBERG reports the case of a woman, 37 years of age, who was suffering during menstruation from hemorrhages from the left ear. The bleeding was always announced by pain, intense sensation of heat, and sometimes of tickling in the external meatus, and by impairment of hearing. The hemorrhage occurred at times without any other symptoms. About a dessertspoonful of blood was always discharged at one attack. The point of exit of the blood could not be traced.

11. Since it is agreed that in railway-spine there are organic and palpable changes in the nervous system, BAGINSKY carefully examined the hearing organ in this disease in this direction. His material consists of five conductors, who were in several railroad accidents. The examination is made with tuning-forks of low (C) and high (*f sharp*) pitch, with whisper, Weber' and Rinné's experiments, and, of course, with inspection of the ears. From the results obtained, the author arrives at the following conclusions: In individuals, whose hearing was heretofore not affected, disturbances of the hearing took place after railroad accidents which showed a certain similarity in the manner of their appearance. The affection was unilateral in three cases, bilateral in two. The subjective troubles consisted in hardness of hearing, tinnitus, and stinging pain. Perception of speech was considerably decreased, and also the cranio-tympanic conduction especially from the vertex. Disturbances of the conducting apparatus could be proved only in one case, so that Rinné's experiment was positive in all five cases. The author concludes therefrom, that we have to deal with an affection of the acoustic nerve, (*a*) either peripherically in the labyrinth, or (*b*), in the conducting path of the acoustic. A good deal speaks for a central disturbance.

12. The artificial drum-membrane in RING's case was a plug of larding pork which had been worn continually with frequent renewals for 8 years. The middle ear and external meatus were much inflamed and there was a quantity of pus and detritus. The case was treated antiseptically, and in time healing took place with hearing of R  $\frac{6}{40}$ , L  $\frac{5}{40}$ .  
SWAN M. BURNETT.

13. "Allochirie" means confounding of sensation, whereby individuals, especially those affected with diseases of the spinal cord, *e. g.*, tabics, etc., allege to feel an irritation, acting upon a left part of the body, on the right side, and conversely. If this phenomenon is transferred to the ear, those sounds were heard only on the right side, the origin of which is placed on the left side of the head. GELLÉ's case was a patient, who had suffered in the left ear from a chronic suppuration of the middle ear, probably in connection with caries.

14. KRETSCHMANN discusses the demands of antiseptics in otology and the remedies which are used as germicides in the treatment of otorrhœa (carbolic acid, sublimate, boric acid, hypermanganate of potash, iodoform, alcohol and chlorine water) According to Kretschmann the only real antiseptics to be used

are: sublimate, chlorine water, and iodoform. He uses in a number of chronic otorrhœas for instillations the acidulous solution of sublimate; aqua 100, sublimate 0.1; acid mur. 1.0. Kretschmann cannot give as yet a definite judgment about the obtainable results. But his judgment on the treatment with boric acid is the more pronounced as he regards its general use as irrational. Kretschmann seems to lack personal experience with the remedy, or he could not otherwise assert that its application produces a greasy, doughy mass. Before we recommend new remedies, we should prove that they act more rapidly and certainly than those employed up to date. As long as this proof is wanting pure theoretical propositions must appear as useless.<sup>1</sup>

b.—INSTRUMENTS AND METHODS OF EXAMINATION.

15. LUCÆ, AUGUST, Berlin. On the discovery of the ear-mirror, and a practical handle for the mouth. *Arch. f. Ohrenheilk.*, vol. xxvi.

16. Prof. EULENBURG, Berlin. A modified aural (and laryngeal) electrode. *Monatsschr. f. Ohrenheilk.*, 1888, No. 5.

17. BEERWALD, Leipzig. Apparatus for the air-douche. *Arch. f. Ohrenheilk.*, vol. xxvi., p. 240.

18. MURDOCH, RUSSELL. Ear instruments. *N. Y. Med. Journ.*, Feb. 18, 1888.

19. HOLT, E. E. An efficient powder-blower, with remarks upon the use of powder in the treatment of diseases of the ear. *Trans. Amer. Otol. Soc.*, 1887.

20. BURNETT, C. H. An examination of fifteen deaf-mutes by means of J. A. Maloney's otophone. *Trans. Amer. Otol. Soc.*, 1887.

21. LORING, F. B. An examination of deaf-mutes by means of J. A. Maloney's otophone. *Trans. Amer. Otol. Soc.*, 1887.

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<sup>1</sup> Rev. cannot forbear mentioning an excellent example of the rapid action of boric acid. F. W., boy, of Forst, 15 years old, suffered 9 years from otorrhœa on the left side, which began after scarlatina. Admitted to the aural clinic at X., June 15, 1887, he was treated for 3 months with injections, caustics, and actual cautery; after which the discharge became more and more profuse. He was then told that something should be chiselled away on account of the existence of caries, and a nail be introduced into the wound. Patient left the clinic, and came under my care 3 weeks after. Discharge of the same intensity as before. Complete destruction of drumhead. Insufflation of boric acid, applied twice, stopped discharge completely. I had the opportunity of convincing myself 6 months later that there were neither moist nor dried-up secretions in the ear.

22. GELLÉ. Étude sémiologique du rôle de l'épreuve de WEBER dans le diagnostic des maladies de l'oreille. *Ann. des mal. de l'oreille*, etc., 1888, No. 5.

23. KNAPP, PROUT, and ROOSA (Committee). Report on the examination of the power of hearing, and how to record its results. *Trans. Amer. Otol. Soc.*, 1887.

15. LUCÆ explains that v. Helmholtz should be considered as the intellectual originator of the ear-mirror, since he recommended his first ophthalmoscope also for the examination of the ear. (Helmholtz's communication was made in the year 1851, while Hoffmann's perforated shaving mirror is pictured in Frank's text-book, which appeared in the year 1845.) Lucæ could not become familiar with the head-mirror, believing that slight displacement of the skin of the forehead makes the illumination indistinct and oscillating; he therefore uses a modification of Czermak's mouth-mirror. In order to obtain a better fixation, the hard-rubber plate should have on both sides an impression of a few teeth of the operator. The mirror is connected with the plate by means of three double ball-and-socket joints. Since one such joint allows the freest movement in all directions, there appear to be too many joints in Lucæ's instrument.

16. In place of Brenner's wire electrode, which is introduced through a hard-rubber speculum into the external meatus, filled with water, EULENBURG devised another aural electrode, because it was too irritating. It is a platinum loop with a sheath. If we cover the loop with a cotton-pellet, and fix the sheath over the pellet, so that a portion of the cotton projects, the moistened cotton-pellet serves as electrode. At the handle exists a device for interrupting. The use of a speculum becomes superfluous,—and also the filling of the external meatus with water, whereby the cotton-pellet serves as a broad, moist conductor.

17. BEERWALD ordered an apparatus for the air-douche, a double-ball with a treadle, the price of which, including the disinfecting capsule, amounts to \$3.75. The treadle-ball is made of black rubber, surrounded with a tissue, which makes it much more voluminous than our ordinary instruments.

18. The instruments offered by MURDOCH are: A modification of the snare, a furuncle knife, a canula forceps, and a portacide, all of which are figured. SWAN M. BURNETT.

19. The powder-blower presented by HOLT consists of a short glass tube attached to a rubber tube. The powder is to be



drawn up into the glass tube by suction, and then blown into the ear with the mouth. The patient can be instructed to use it himself. The paper gave rise to a long discussion on the efficiency of powder in the treatment of ear diseases, in which nearly all the members took part, and representing all shades of opinion.

20. These examinations of C. H. BURNETT were made at the Pennsylvania Institution for the Deaf and Dumb, and comprehended three typical classes, viz. : five congenital cases ; five who lost hearing between one and five years ; five cases of profound hardness of hearing, but who can hear a little, can talk, and understand lip-reading (semi-mutes). In the first series of cases certain vowels and words were undoubtedly heard through the instrument, and in the second series also certain letters and words were correctly indicated as being heard. In some of the semi-mutes every thing said through the otophone was distinctly heard. He considers the instrument as valuable for the education of the remaining hearing-power in the semi-mutes.

SWAN M. BURNETT.

21. LORING made an examination of a number of deaf-mutes and semi-mutes with Maloney's otophone, and in quite a number the hearing power was markedly improved. One of the congenitally deaf could understand some words, and several most of the vowels.

SWAN M. BURNETT.

22. GELLÉ thinks himself justified in believing that the intensification of sound in Weber's experiment can be explained in two ways, either by the formation of resonant cavities, or by the increased tension produced by the pressure of the finger upon the ear. If the experiment can thus be explained in two ways, can it then be used for diagnostic purposes? Gellé answers this question in the affirmative, excluding all those cases from the diagnosis in which the resonance has been altered by changes in the external meatus. Gellé believes that the possibility of changing the perception of sound of the tuning-fork, acting from the vertex, by the pressure of the finger upon the external meatus may serve as an excellent aid in prognosis.

23. The report of the committee embraces tests by (1) the watch and acoumeter, (2) the voice, and (3) tuning-forks. For details of the consequences of the well-known principle, compare the original and a paper of Dr. KNAPP read before the Fourth International Otological Congress, Brussels, 1888.

SWAN M. BURNETT.

C.—EXTERNAL EAR.

24. BARTH, ADOLF, Berlin. A peculiar wart near the auricle. *Virchow's Archiv*, vol. cxii., 1888.

25. MIOT and BARATOUX. De la contusion du pavillon de l'oreille. *Progrès médical*, 1888, No. 1.

26. BARCLAY, ROBERT. Tubercular syphilide of the auricle, becoming serpiginous, with ulceration and sequestration of the cartilage of the concha, tragus, and canal, followed by membranous atresia. Deafness; operation; cure. *Journal of Cutaneous and Genito-Urinary Disease*, March, 1888.

27. BURNETT, C. H. The successful removal of an exostosis from the external auditory meatus by means of bone-forceps and chisel. *Trans. Amer. Otol. Soc.*, 1887.

28. GROSCH, Neuhaus. Furunculosis of the ear. *Berlin klin. Wochenschr.*, 1888, No. 18.

29. BLAU, Berlin. Otitis from infection. *Arch. f. Ohrenheilk.*, vol. xxvi., p. 229.

30. HESSLER, Halle a. s. Otitis externa ex infectione. *Deutsche med. Wochenschr.*, 1888, No. 17.

24. BARTH found in a girl, twenty years of age, a wart  $\frac{3}{4}$  cm below the attachment of the right lobules, which had a striking resemblance to a nipple. It was from 2 to 3 mm high, had a pigmented area, and was erectile to the touch. On microscopical sections of the extirpated tumor a very marked development of large sebaceous glands was found. Barth believes that such a structure has not yet been observed on the head, and is closely allied to a rudimentary mammary gland.

25. In this paper the so-called othæmatomata are believed to be produced by contusions, viz., by ill-treatment, blows on the ear by the attendants, etc. The spontaneous formations of cysts, which, as is known, are no blood-tumors, and the traumatic hæmatomata are confounded with each other. Course, prognosis, and treatment are described as identical for both kinds, and nothing of interest is communicated in the lengthy paper.

26. BARCLAY's patient was a man, thirty-two years old, with a history of syphilis "years ago." The trouble began with a "charred" discoloration on the upper portion of the auricle, progressing rapidly to the external meatus, which finally showed a plain line of demarkation, and the whole charred portion was

easily removed by forceps. Healing then ensued with closure of the meatus by a membrane, which, when seen by Barclay, was bulging, and on incising which a large amount of sanguineous pus escaped. A remnant of the membr. tymp. was seen behind. The canal was now treated by antiseptic washes and a tampon, and later by a hard-rubber canula, with the result of a final healing and a restoration of hearing to  $\frac{3}{4}$ . SWAN M. BURNETT.

27. In C. H. BURNETT's case the bony growth sprang from the anterior wall of the right meatus, just within the ring of the tympanic bone. It closed, almost hermetically, the opening of the canal. It was pedicillate. It was attacked with bone-forceps at its apex, and afterwards the portions near the pedicle were removed by chiselling. SWAN M. BURNETT.

28. In this very painful affection GROSCH was frequently left in the lurch by the methods employed at present: Schwartze's one-per-cent. solution of kalium sulfuratum; Weber-Liel's sublimate alcohol, and Politzer's carbolic oil. He tried by chance aluminium aceticum, one part dissolved in four parts of water. It is instilled into the external meatus after incision, where it remains for some time and is renewed in four hours. Pain had usually disappeared in from four to eight hours, and the furuncles, not having been incised, did not form again. The author believes that aluminium aceticum softens the tissues, removing thereby pressure and pain, and also promoting a definite cure by its disinfectant action.

29. BLAU points out that the form of otitis externa circumscripta, which he has described before, bears a close resemblance to Hessler's otitis ex infectione. The possibility of an infection from without was not suspected by him.

30. HESSLER describes again in this paper the disease, called by him otitis externa ex infectione, adding three new characteristic cases observed since his last publication. The same characteristic differences between this disease and furunculosis are mentioned as before. Hessler, in opposition to the investigations of Loewenberg and Kirchner, is not inclined to consider furunculosis as an otitis ex infectione.

d.—MIDDLE EAR.

31. Prof. E. ZAUFAL. Further communication on the occurrence of micro-organisms in the secretions of otitis media acuta (genuina). *Prager med. Wochenschr.*, 1888, No. 8.

32. ZAUFAL. Streptococcus pyogenes in otitis media and its sequelæ. *Ibid.*, Nos. 20 and 21.

33. Prof. VALENTIN, Berlin. A case of thrush of the middle ear. *Arch. f. Ohrenheilk.*, vol. xxvi., p. 81.

34. POMEROY, O. D. A case of desquamative inflammation of the middle ear, with remarks. *Trans. Amer. Otol. Soc.*, 1887.

35. ROOSA, D. B. ST. JOHN. A case of acute suppuration of the tympanum occurring in a patient with chronic Bright's disease. Death. Description of the temporal bone. *Trans. Amer. Otol. Soc.*, 1887.

36. VOSS, Riga. Contribution to scarlatinous otitis media. *Arch. f. Ohrenheilk.*, vol. xxvi., p. 231.

37. KIELLER, C., Cologne. Neuritis optica in disease of the middle ear. *Monatsschr. f. Ohrenheilk.*, 1888, No. 6.

38. Prof. WALB, Bonn. On fistular openings at the upper pole of the drum-membrane. *Arch. f. Ohrenheilk.*, vol. xxvi., p. 185.

39. SEXTON, SAMUEL. Excision of the ossicles of the drum of the ear for the cure of chronic purulent inflammation of the middle-ear tract. *Trans. Amer. Otol. Soc.*, 1887.

40. STACKE, Erfurt. Ten cases of operative removal of the malleus. Clinical contribution to the excision of the malleus. *Arch. f. Ohrenheilk.*, vol. xxvi., p. 115.

41. ROOSA, D. B. ST. JOHN. A case of cerebral abscess from suppuration in the middle ear. Death from meningitis. Presented with the temporal bone of the affected side. *Trans. Amer. Otol. Soc.*, 1887.

42. BRAKER, ARTHUR, E. Notes on a case of cerebral suppuration due to otitis media. Diagnosed and successfully treated by trephining and drainage. *Brit. Med. Jour.*, April 14, 1888.

43. HESSLER, Halle <sup>a</sup>/S. Four cases of caries of the middle ear, with bulging of the transverse sinus displaced forward. *Arch. f. Ohrenheilk.*, vol. xxvi., p. 169.

44. ABBE. Acute meningitis following otitis media purulenta. *N. Y. Med. Jour.*, February 25, 1887.

45. SCHMIEGELOW, Copenhagen. Some rare cases of disease of the middle ear, complicated with intracranial affections. *Arch. f. Ohrenheilk.*, vol. xxvi., p. 84.

46. TURNBULL, LAWRENCE. Treatment of chronic purulent

inflammation of the middle ear (otorrhœa). *Four. Amer. Med. Assoc.*, June 9, 1888.

47. Prof. BEZOLD, Munich. A reply to Stacke's "Treatment of otorrhœa with powdered boric acid (warning to colleagues)." *Deutsche med. Wochenschrift*.

48. EITELBERG, A., Vienna. On treatment with creolin in aural diseases. *Wien. med. Presse*; 1888, No. 13.

49. BENNET. Instillation of nitrate of silver into the ear. *Lancet*, February 4, 1888.

50. POMEROY, O. D. On some points in the management of the Eustachian tube in certain ear affections. *Med. Record*, February 18, 1888.

51. SUAREZ de MENDOZA, FERDINAND. Sur le traitement des obstructions de la trompe. *Revue mens. de laryngologie*, etc., 1888, No. 6.

52. BOUCHERON, M. Opération de la surdité otopésiique. *Le bulletin méd.*, April 25, 1888.

53. BAGINSKY, B., Berlin. The affections of the middle ear. *Eulenburg's Real-Encyklopædie*, vol. xiii.

31. ZAUFAL, in addition to the two cases of otitis media previously reported, in which the diplococcus (Friedlaender) and the diplococcus (A. Fraenkel) were found in the secretions, reported another case, in which pneumonia was not present, and the diplococcus could be traced by pure cultivations from the secretions. The culture experiments and inoculations are fully described. Pyogenous micro-organisms were not found.

32. After v. Netter found streptococci exudations on the meninges in caries of the temporal bone, and also Moos in the labyrinth in cases which died from diphtheria and measles, ZAUFAL succeeded in tracing the streptococcus pyogenes in the secretions of three cases of otitis media suppurativa. Two of them were complicated by abscesses in the tissues surrounding the ear. "These cases, though few, point to the fact, that the streptococcus pyogenes plays an important part in the causation of the serious and perilous complications of otitis media: meningitis, abscess of mastoid process, and metastatic abscess, and most likely also of encephalitis, labyrinthitis, sinus thrombosis, and pyæmia without sinus-thrombosis."

"The presence of the streptococcus pyogenes in the secretions of otitis media is prognostically of the greatest importance, and it



matters little whether the streptococcus is in a special case the primary cause of the inflammation or its presence is due to a secondary infection." We refer the reader to the original with regard to the further interesting statements of the author, who leaves the decision on a series of questions to the future.

33. VALENTIN found, in a consumptive girl with otorrhœa, 9 years of age, a white coating upon the mucous membrane of the pharynx and naso-pharynx, which on microscopical examination proved to consist of masses of the thrush fungus. The external meatus was filled up with a cheesy, readily removable white mass. Still more firmly adherent white coatings were perceptible in the middle ear, after the removal of which the mucous membrane bled somewhat. These masses were full of the fungi. Injections of a solution of chlorate of potash and of a 2-per-cent. solution of sulphate of copper, the latter being the most efficacious poison for many moulds and fungi. Cure, but with slight discharge remaining. This case appears to be the first observation of thrush in the middle ear.

34. In such cases POMEROY thinks there might be a difficulty in diagnosticating them from aspergillus. In addition to the microscopic test he would rely also upon the presence of an odor, which is not found, according to his experience, in aspergillus.

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35. ROOSA's patient was a woman, 42 years of age, in advanced stage of Bright's disease. The attack, in the left ear, was acute; chronic middle-ear trouble in both for a long while. Paracentesis of *Mt* with some relief. Pain returned and tenderness at junction of temporal and occipital bone. Temp. 103°. Died 34 days after she was first seen. Examination of the temporal bone showed carious softening of the wall of the drum cavity. Middle ear filled with pus. Seventh nerve exposed and imbedded in pus. Mastoid free from disease.

SWAN M. BURNETT.

36. VOSS discusses the inflammations of the middle ear occurring in scarlatina. The inflammations of the middle ear arising at the height of the exanthema or of the complicating diphtheria take a much severer course than the forms setting in as late as the third or fourth week. Voss points to the form belonging to the sequelæ, which is not immediately connected with the scarlatina, but directly depending upon the nephritis accompanying it. The inflammation of the ear develops together with the diminished secretion of urine and with the accompanying fever. The

decrease of the secretion of urine corresponds to the increase of the hyperæmia of the tympanic cavity.

37. KELLER points out, that the views on the connection between neuritis optica and diseases of the ear vary to a considerable extent. Whilst Zaufal found almost invariably neuritic changes at the fundus of the eye in meningitis ex otitide, Kipp contradicted altogether the frequency of this combination. Keller describes the following case observed by himself. A child, 7 years of age, contracted after measles an inflammation of the left ear, which led to perforation in the lower quadrant. Ten days subsequently pain returned with inflammation of the external meatus, and of the mastoid process, with want of sleep, cerebral headaches, and loss of strength. The upper wall of the external meatus descended at the same time in front of Shrapnell's membrane, thereby covering more than half of the drum-membrane. Rigors; rise of temperature to  $39.8^{\circ}$  C. The ophthalmoscope revealed bilateral turgid and tortuous retinal veins with increased redness of both papillæ, wherefrom a sudden hindrance of the venous circulation from the retina could be inferred. The following day decrease of fever, with rapid subsequent cure of the ear disease. During the sixth week of the disease paresis of the left abducens, bilateral papillitis with marked symptoms of choked disc, set in. Keller believes that the intracranial complication should be considered as a consequence of the ear disease, leaving undecided whether it was a sinus-thrombosis or not.

38. WALB gives a full and interesting description of the diseases associated with perforation of Shrapnell's membrane.<sup>1</sup> We confine ourselves to mentioning a few points of the paper. Although Walb thinks it to be clearly established that the primary otitis media is an etiological factor in the development of a fistula at the upper pole of the drum-membrane, still his own observations led him to the belief that in the greater number of cases an affection of the external ear causes the development of these fistulæ in two ways: (1) An otitis externa circumscripta affects just the margin of the membrana flaccida, or an otitis externa diffusa also involves this membrane; (2) an affection of the external ear, associated with secretion, though at first not having affected this region, produces an infection or an affection of these parts of the

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<sup>1</sup> The author did not make use of Burnett's paper: "Perforations in the membrana flaccida, the tympanic diseases they accompany, and their treatment," which appeared in 1881 in *Americ. Journ. of Otol.*, vol. iii., p. 12.

middle ear through an abnormal communication between the external meatus and the cavities situated behind the pars flaccida. The abnormal communication is formed by the foramen Rivini, which frequently exists. The presence of a foramen Rivini may render purulent an otitis media acuta, which has no tendency to suppuration. According to Walb's observations we have, in a number of cases of perforations of the membrana flaccida, to deal at the beginning only with a purulent otitis of the osseous margin, to which the membrane is attached. Secondly there arises a caries of the head of the malleus. Walb also refutes the recent attacks of the treatment with boric acid. He points out to Stacke and Kretschmann that we have not to deal, in the treatment of otitis purulenta media, with the destruction of anthrax spores, but with that of pyogenous bacteriæ. Prejudice will not annihilate the good results that have been obtained with boric acid.

39. SEXTON adds to his communication before the society at its last meeting an analysis of nineteen cases operated on since the last report. They ranged in ages from five to forty years. Thirteen were women. In most of the cases the membrana flaccida was almost the only portion of the drumhead remaining, and in a large number the remains of the ossicles and cicatricial structures were found adhering to the inner wall of the drum, and in such a way as to prevent drainage from the "attic." Of the nineteen cases—five cases were cured in less than one month, two in two months, two in three, one in six. Eight were still under observation, and one discontinued treatment. Reproduction of the drum-membrane did not occur in a single instance.

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40. STACKE divides the indications for the operative removal of the malleus into two groups. One group comprises those cases which require the execution of the operation according to purely surgical principles (caries of malleus, impediment to free discharge of secretions); in the other group of cases the operation is performed for the removal of disturbances of hearing. Ten histories of cases.

41. The case of ROOSA referred to a boy, eleven years old, with the usual history of suppuration of the middle ear, and a pre-auricular abscess, which was opened. Relief; but on the 9th day afterward fever set in and the boy died of meningitic symptoms. Examination showed an abscess in the temporo-sphenoidal lobe 1½

inches in diameter. The upper wall of the external meatus was necrotic for a space as large as a silver half-dollar.

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42. BRAKER'S interesting case was that of a man, thirty years of age, who had repeatedly suffered from otitis media purulenta and was affected with lateral sclerosis of the spinal cord. December 5, 1887 : Suppuration of the right ear, followed by pain over the entire right half of the head. No retention of secretions, no inflammation of the mastoid process. January 20, 1888 : Vomiting twice, right half of the head very sensitive, two epileptic paroxysms, gnashing of teeth, convulsions on the right side, staggering to the left, pupil narrower in the right than in the left eye. On opening the mastoid no pus was found. February 1st : Complexion yellowish, fallow, rapid emaciation, incontinentia urinæ, stupor, somnolence, weakness of the left arm, facial paralysis. An abscess in the temporo-sphenoidal lobe having been diagnosed, trephining was resorted to. An opening was made in the parietal bone with a trepan of one inch in diameter, and was enlarged through further boring. After incising the dura mater the surface of the cerebral convolutions was found to be healthy, but fluctuation was found deeper. No pus discharged through the trocar. Another opening was then made with the trepan  $1\frac{1}{2}$  inches above and  $1\frac{1}{4}$  inches behind the aural opening, and a needle passed  $1\frac{1}{2}$  inches deep forward and inward, whereupon half an ounce of thin, inoffensive pus was discharged. A rubber drainage-tube was introduced  $1\frac{1}{2}$  inches deep. Iodoform dressing. Two weeks after the operation the patient was out of danger and the drainage-tube could be removed. Braker thinks that it was not an abscess of the temporo-sphenoidal lobe, but one in and around the fossa Sylvii.

43. HESSLER discusses in the beginning of his paper the location of the transverse sinus, and mentions the views of Bezold and Politzer (Koerner's interesting paper seems to be unknown to him). He then collates twelve cases from literature, in which the sinus was laid bare during operation. He relates the histories of four personal observations. The duration of personal daily treatment of the suppuration for several months without benefit, was an indication for chiselling the mastoid process. A cure was effected in all cases, even when the sinus had been denuded. At the conclusion, some remarks follow on treatment of otorrhœa. Hessler has seen good results from instillations of a 4-per-cent solution of carbolic acid, to be applied every two hours. He fre-

quently observed, that although a solution of 0.1 per cent. of sublimate was of no avail, a solution of boric acid dried the ear.

44. ABBE'S case was a typical one of acute otitis media, and following it acute meningitis. Choked disc on the same side. Autopsy showed purulent meningitis at base of cerebrum and lower surface of cerebellum. No evidence that the pus had extended from the ear. The internal auditory canal showed streaks of pus following the course of the nerve.

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45. The first of the four cases reported by SCHMIEGELOW is that of a man who, having suffered for some years from a chronic non-suppurative catarrh of the middle ear, was suddenly seized with a severe neuralgia of all three branches of the right trigeminus, followed by a facial paralysis of the same side, and simultaneously by choked disc and symptoms of neuritis optica. A year after the beginning of the pain, symptoms of a chronic, non-suppurative catarrh of the middle ear appeared. Later on thick yellowish-green, non-offensive discharge from the ear, with pain behind the ear and swelling of the region of the mastoid process. On chiselling the mastoid a few drops of pus and some granulation tissue were found in the depth. No relief from the very severe pain. Oedematous swelling of the paralyzed side of the face. Extensive trephining of the cranium from the fossa cranii poster.; no pus was found subsequently. Chiselling from the fistula in the mastoid in a backward direction. Everywhere disintegrated granulation tissue interspersed with osseous sequestra. These masses were connected with similar ones in the fossa cranii posterior, between dura and cranium. Improvement ensued; discharge from the hospital; but four months subsequently nausea, fever, intense headaches, vomiting, increasing unconsciousness, death a month later. Autopsy showed diffuse purulent leptomeningitis. Discharge of pus from the temporal lobe of the cerebrum, and from the soft parts in the spheno-petrous fissure. No defined abscess cavity. Schmiegelow believes that trephining through the squama ossis temporis, instead of opening the fossa cranii poster., would have led to the discovery of the seat and the cure of the cerebral lesion. The second case is that of a woman with pyæmia and caries of the mastoid process, following an *otitis media acuta purulenta*. Chiselling of the mastoid under chloroform. Mastoid filled with pus and granulations. Sudden discharge of a current of pus from the posterior part of the wound. It issues from



an epidural abscess 3 *cm* deep, which is freely laid open. Cure. Third case : Otitis suppurativa dextra. Paresis of the facial nerve. Intense cerebral symptoms (headaches, vomiting, high temperature, slow pulse). Symptoms of retention of secretions in the mastoid process. Chiselling. Considerable improvement. Sudden death on the 7th day of convalescence. Autopsy refused. Fourth case : Otitis chronica suppurativa sinistra. Symptoms of retention of secretions in the antrum mastoideum. Chiselling failed to open the mastoid process ; which was again attempted eight months later. Lesion of the transverse sinus. Atrophy of both optic nerves. Chiselling of the antrum. Final result unknown.

46. In the treatment of otorrhœa TURNBULL relies more on levigated boric acid alone, or in combination with iodol, than on any other remedy, especially if the perforation is large. He packs the meatus with powder. If the perforation is small he uses solutions of boro-glyceride, carbolic acid, or the peroxide of hydrogen. In perforation of Shrapnell's membrane and disease of the attic, he removes the discharge by means of an intra-tympanic syringe.

S. M. BURNETT.

47. BEZOLD's publication is a reply to Stacke's attacks of the treatment with boric acid. Bezold proves himself justified in calling the method of treatment introduced by him, antiseptic, shows how false and unfounded Stacke's objections are, and relates an instance of the manner in which Stacke interpreted his histories, in order to draw therefrom the desired inferences.

48. EITELBERG reports his experience with creolin made at the aural department of Urbantschitsch. In otitis media suppurativa 10 drops of creolin to a half litre of lukewarm water are sufficient for injections into the ear. Stronger solutions cause unpleasant burning. The same solution is instilled afterwards. Acute inflammations in particular, even of a more serious nature, were brought to a comparatively rapid cure. The author leaves it undecided whether in chronic purulent inflammations better results may be accomplished than those with the usual remedies.

49. BENNET tried an instillation of a 20-per-cent. solution of nitrate of silver in a case of granular suppurative inflammation of the tympanum with large perforation of the drum-membrane. The reaction was very unpleasant, since the intense pain immediately following did not cease in spite of the simultaneous neutralization, but continued three days and longer. The suppuration persisted, and the hearing of this ear was totally destroyed for almost two

months. Simple insufflations with powdered alumen then rapidly stopped the discharge.

50. POMEROY considers the treatment of the Eustachian tube from several standpoints, and we note the following among his conclusions : In acute purulent otitis he finds relief from inflation sometimes ; occasionally, however, it causes pain, and should be tried tentatively by Politzer's method. He finds that sometimes deglutition acts as inflator of the drum cavity as well as a rarefier, and thinks frequent acts of deglutition may serve as useful gymnastics to the tubal muscles. He has found too patent a tube with crackling noises to coapt itself after an application of 20 gr. of argent. to  $\frac{3}{4}$  i water. He thinks that on the whole Politzer's method is the best for inflating the tympanum, but that it should not be performed too frequently nor left in the hands of the patient. Finally, that change of climate is often the only thing that can permanently influence a tubal catarrh. SWAN M. BURNETT.

51. SUAREZ DE MENDOZA recommends for swelling of the Eustachian tube the use of bougies, in case the application of the catheter and of Politzer's method have proved inefficacious. If their temporary use has no effect, they should be left there for three to ten hours or longer, according to the degree of tolerance. If even this is without success, the constant current and finally electrolysis should be applied.

52. The paper, presented to the *Académie des Sciences*, refers to a so-called new operation for mobilizing the stapes in old, severe cases of hardness of hearing caused by pressure in the labyrinth. The operation is recommended, if the stapes is immovably fastened by pressure into the labyrinth in a faulty position, and if the stapes shows the tendency to ankylose in the oval window, whereby the labyrinthian pressure and the consecutive deafness become permanent. The report does not contain any thing on the method of performing this "new" operation. In one case with destruction of the drum-membrane and loss of malleus and incus, the stapes was mobilized, in another not until the drum-membrane and the ossicles were removed ; in both cases considerable improvement of hearing was effected. It is known that BOUCHERON believes deafness to be dependent in most cases upon pressure in the labyrinth, although the anatomical conditions of the labyrinth, especially the communication of the labyrinthian fluid with the cranial cavity, do not appear to render possible the persistency of a pressure confined to the labyrinth.

53. The subject of BAGINSKY's treatise in Eulenburg's Encyclopædia is arranged in a similar manner to that in the text-books, on otology, and begins (1) with otitis media acuta, followed by (2) otitis media chronica, which is subdivided into (a) the chronic catarrh with hyperæmia and swelling of the mucous membrane, (b) the catarrh with new-formation of connective tissue. We recognize as second principal group, (3) the acute purulent inflammation, and (4) the chronic purulent inflammation of the tympanic cavity. Etiology, symptomatology, pathological anatomy, prognosis, and treatment of all these affections are fully discussed. In the treatment of acute otitis, Bendelack-Hewetson's method, instillations of 5-10-per-cent. solutions of carbolic glycerin, is not mentioned. It is among the new remedies, and of such great advantage to the practitioner that it should not be overlooked. In the treatment of chronic purulent otitis the author feels justified in arguing against the excessive application of injections from the tube through the tympanum, as is recommended by a number of aurists as a remedy *par excellence*.

e.—NERVOUS APPARATUS.

54. ROOSA, D. B. ST. JOHN. Remarks upon the diagnosis of chronic lesions of the labyrinth or acoustic nerve with illustrative cases. *Trans. Amer. Otol. Soc.*, 1887.

55. ROOSA, D. B. ST. JOHN. The differential diagnosis of peripheral and central diseases of the ear. *Med. News*, April 21, 1888.

56. THEOBALD, SAMUEL. A case of syphilitic disease of the labyrinth, exhibiting remarkable variations in the degree of deafness. *Trans. Amer. Otol. Soc.*, 1887.

57. Prof. Dr. LUCÆ, Berlin. Ménière's disease, or morbus apoplectiformis Ménière. Reprint from *Eulenburg's Real-Encyclopædie der ges. Heilkunde*.

58. SHARKEY, SEYMOUR. I. A fatal case of tumor of the left auditory nerve. *Brain*, April, 1888.

54. The diagnosis in the following cases was based upon the relative duration and intensity of aërial and bone-conduction, the author thinking them a reliable test for differential diagnosis of diseases of the middle and internal ears. Case I. A sensation of sudden filling up of the ear while sleigh-riding; treatment for disease of the tympanum without benefit. Case II. Tinnitus

aurium for a year in an anæmic woman ; impairment of hearing for the watch very marked. Case III. Impairment of hearing for 4 years ; occasional dizziness ; deafness ascribed to listening to the voice in a speaking-tube. Case IV. Neuralgic pains in the ear ; impairment of hearing. Case V. Overworked physician suffers from unpleasant sensations in his ears. Case VI. Difficulty of hearing in a noise. Case VII. Sore-throat and tinnitus aurium ; no impairment of hearing for the voice in quiet places. Case VIII. Impairment of hearing and dizziness ; tympanic disease engrafted on one of the labyrinth. SWAN M. BURNETT.

55. This paper contains a reiteration of ROOSA's views on the differential diagnosis of central and peripheral deafness well-known to our readers. In troubles of the conducting apparatus external noises improve hearing power, in central affections they lessen it. Patients with nervous deafness hear the human voice out of proportion to their ability to hear the watch. Better bone-conduction of the tuning-fork argues trouble in the conducting apparatus. SWAN M. BURNETT.

56. THEOBALD's patient was a man 30 years old, who denied having contracted syphilis, but believed that he had inherited the disease. Deafness in left ear almost absolute. R : W on contact ; tuning-fork felt rather than heard. Politzer-made no change. There was marked improvement after the use of hydrarg. bichlor. and ammon. muriat. ; potass. iodid. seemed to make him worse.

SWAN M. BURNETT.

57. LUCÆ emphasizes in his treatise on Ménière's disease all the objections that have been set forth against the prevailing explanation of this affection. Upon the whole he arrives at the result, that physiology as well as pathological anatomy should throw more light upon these conditions. Whilst the name Ménière's disease should be used only for the entire complex of symptoms as depicted by Ménière, Lucae suggests the name " morbus apoplectiformis Ménière." With regard to treatment, this is without avail in the majority of cases. In recent cases profuse local blood-letting is recommended. Extract. secal. corn. was given without success. Dizziness was relieved by several weeks' absolute rest. It is about time to erect a barrier against " the atrocious recklessness " of treating these patients in dispensaries and by irrational methods. The author considers sweating by means of subcutaneous injections of pilocarpine as the most effectual remedy, although it left him in the lurch in a large number of cases.

58. The patient is a man, 41 years of age. For one year, headache, dizziness, faint noises in the ear, deafness, and slight disturbance of sight. Parietal and frontal headaches were permanent, with temporary exacerbations, in which the objects seemed to turn to the left. These attacks sometimes reached nine daily, and the patient was even in bed not free from dizziness. The vertiginous attacks were connected with fainting conditions. These began with increased vertigo *without* increase of the noises, indistinct sight and loss of consciousness, lasting about ten minutes. *Vomiting never took place.* No other peripheral nervous disturbance. There existed bilateral choked disc. Mr. Clutton, an aurist, found as follows : drum-membrane normal ; watch—2 inch. A D, A S no hearing for the watch ; tuning-fork—A D normal, A S not perceived with open or closed external meatus. Another point against the existence of disease in the ear was, that the paroxysmal increase of the noise in the left ear did not coincide with the vertiginous attacks ; the latter were in other respects of the nature of "aural vertigo." The diagnosis wavered between an affection of the trunk of the acoustic nerve and of the hearing centre in the temporal lobe. Furthermore, psychical disturbances occurred : facial hallucinations, refusal of nourishment. The sight decreased gradually ; patient died after the attacks of loss of consciousness had become more frequent. Autopsy : tumor in the middle of the trunk of the left acoustic nerve larger than a horse-chestnut, situated in the angle between cerebellum and pons, compressing the latter. No other nerve was involved in the tumor. The symptoms were most likely caused by the affection of the acoustic nerve. Still it is questionable whether the compression of the left half of the cerebellum played no part.

Moos.

## f.—NOSE AND NASO-PHARYNX.

59. JOAL, Mont-Dore. De l'épistaxis génitale. *Rev. mens. de laryngologie*, etc., No. 2, 1888.

60. BRESGEN, M. Croup of the nasal mucous membrane. *Deutsche med. Wochenschr.*, No. 4, 1888.

61. CHOLEWA, R., Berlin. Menthol in diphtheria of the nose. *Therapeutische Monatshefte*, June, 1888.

62. MIOT, E. Remarques sur certaines obstructions nasales. *Revue mens. de laryngol.*, etc., Nos. 5 and 6, 1888.

63. STAN, W., Heidelberg. Contribution to the treatment of



deviations of the nasal septum. *Przegląd lekarski*, Nos. 10 and 11, 1888.

64. HOPMANN. On congenital stenoses and occlusions of the posterior nares. *Arch. f. Chir.*, vol. xxxvii., No. 2.

65. PELTESOHN, N., Berlin. Three cases of collection of pus in the frontal sinus and the orbit. *Centralbl. f. Augenheilk.*, February, 1888.

66. ZIEM, Danzig. On the best method for opening Highmore's antrum. *Therapeutische Monatshefte*, Nos. 4 and 5, 1888.

67. LINK, IGNAZ, Lemberg. Clinical contributions to the operative treatment of empyema of Highmore's antrum according to the method of Prof. Mikulicz. *Przegląd lekarski*, No. 5, 1888.

68. MCBRIDE. Empyema of the superior maxillary antrum with only nasal symptoms. *Edinb. Med. Jour.*, April, 1888.

69. BLOCH, E., Freiburg. i. Br. On the bursa pharyngea. *Berl. klin. Wochenschr.*, No. 14, 1888.

70. BLAKE, CLARENCE J. Relation des tumeurs adénoïdes du naso-pharynx avec les affections de l'oreille moyenne chez les enfants. *Annales des maladies de l'oreille*, etc., No. 4, 1888.

71. Prof. KÖNIG, Göttingen. A new method of operation of naso-pharyngeal polypi. *Centralbl. f. Chir.*, No. 10, 1888.

72. WEIL, E., Stuttgart. Contribution to the treatment of chronic pharyngitis. *Monatsschr. f. Ohrenheilk.*, No. 3, 1888.

73. FREUDENTHAL, W., New York. On the connection of chronic obstructions of the nose and the naso-pharynx with abdominal herniæ. *Monatsschr. f. Ohrenheilk.*, etc., No. 12, 1887 and Nos. 1 and 2, 1888.

59. JOAL expresses the view that in nose-bleedings the cavernous tissue plays the most important part. He conceives that some persons display an especial tendency to swelling of the erectile tissue. If the tension in the vessels of the cavernous tissue is excessive, their rupture gives rise to hemorrhage. The author is not acquainted with the fact that no nose-bleeds originate in the cavernous parts of the nose, but all in the anterior portion of the septum or in the floor of the nasal cavity. This has been ascertained by the reviewer and published in these ARCHIVES, and has been confirmed by other observers.

60. BRESGEN observed, after application of galvano-cautery, the same appearances as were seen by the reviewer in croupous

inflammation. Bresgen is undecided whether these cases were genuine croup of the nasal mucous membrane.

61. Owing to the favorable effects of menthol in acute swellings of the nasal mucous membrane and of its anti-parasitic qualities, CHOLEWA applied this remedy in two cases of naso-pharyngeal diphtheria with the best result. The introduction of cotton pledgets saturated with menthol oil (20 per cent.) rendered the previously occluded nasal cavity pervious on the following day.

62. MIOT contributes an extensive treatise on certain nasal obstructions, of which he has observed 10 cases. These obstructions were produced by thickenings upon the nasal septum, situated upon its anterior lower portion, and not extending beyond the cartilaginous part of the nose. These thickenings were supposed to result from a hyperplastic process in the perichondrium consequent upon syphilis and scrofula. Miot removes the swelling by electrolysis, using double needles according to Voltolini's suggestion. If we form an opinion from the histories of cases, Miot's cases seem to represent rather the well-known anomalies of the development of the septum, than perichondritic changes not hitherto observed. (Rev.)

63. STAN'S observations were originally made in Prof. Jurasz's clinic. After discussing the different operative procedures and orthopædic methods of treatment belonging to this category, the author describes the method used in the laryngological clinic at Heidelberg. In slight deviations the lower turbinated body is burned by galvano-cautery, according to Mackenzie's suggestion. In recent traumatic deviations, usually affecting the posterior portion of the cartilaginous septum, cotton tampons are used. The tampons remain in the nose each time from a few hours to one day. The introduction must be repeated, until recovery ensues. In old deviations or those situated far back, Adams-Jurasz's forceps is of great service. The bloody operation is only resorted to in those cases, in which the cartilaginous nasal septum presents a tumor in the nostril. The mucous-membrane covering the tumor is in these cases incised and dissected off, the cartilage cut away, and the mucous membrane stitched together. Finally, galvano-cautery is used in deviations of the vomer, in which the flat burner is made to penetrate the deviation. This procedure is repeated several times at intervals of 8 to 10 days. This method was once employed in deviation of the cartilaginous septum. A description of five different cases illustrates the paper.

64. HOPMANN relates two cases of complete unilateral osseous occlusion of the posterior nares, also two cases of considerable congenital narrowing. He also reports 43 histories of cases of stenosis of the posterior nares, principally observed in children with adenoid vegetations. Hopmann removes the stenosis with the index finger introduced from the mouth, or by a flat instrument introduced through the nostril. Since neither the practitioner nor the anatomist has discovered these narrowings of the choanæ in adults, which Hopmann has operated for in such large numbers in children, and since other observers do not appear to have found them in children with adenoid vegetations, we cannot for bare emphasizing the probability, that Hopman's cases are illusions arising from the digital examination applied for the diagnosis.

65. PELTESOHN reports three cases of empyema of the frontal sinus exhibiting, besides nasal suppuration, an œdematous inflammatory swelling of the corresponding upper eyelids. Incision from without cured in all cases the ocular symptoms by removing the pressure upon the eyeball, etc.; it is not mentioned, that the affection of the sinus itself was cured. Once the probe touched denuded bone; "plugging" with iodoform gauze was used in the after-treatment.

66. ZIEM advises the treatment of empyema of Highmore's antrum only at the maxillary process, and rejects even for diagnostical purposes the injections into the cavity from the meatus semilunaris of the nose, warning against the daily use of cocaine. He employs Cooper's method only with this modification, that he no longer uses the hand-drill, but the American dental engine. By means of very thin drills ( $1\frac{1}{4}$  mm) he makes an exploratory opening, in most cases in the space between the second bicuspid and the first molar, or between both bicuspids. He avoids in this manner the extraction of a healthy tooth, which is necessitated by Cooper's method. There was no absence of teeth in 31 cases out of 67, and in 6 cases no disease of the antrum. If pus appears after the exploratory drilling the opening is enlarged by larger drills up to 3 mm in diameter, and through this the patient is directed to irrigate. The procedure is not new and a skilful operator can dispense with the dental engine.

67. Brief description of two cases in which Highmore's antrum was opened for empyema. In both the empyema was due to dental caries; the teeth were extracted, and a communication between

the mouth and the cavity was discovered. The operation was nevertheless done according to Mikulicz's method in order to relieve the patient from the discharge of pus into the mouth (?). The author asserts that in both cases the alveolar fistula closed in a few days, but it seems remarkable that the opening made from the nostril remained open even for three months, although the author does not mention the introduction of any tube through the opening. In the second case another pathological opening existed below the corresponding eye, and the natural opening (probably the accessory one) was so large that a curved probe could be readily passed. Nothing is mentioned of a rhinoscopic examination. The author greatly prefers Mikulicz's to Stoerk's method. In conclusion the author furnishes a diagnostic aid for the recognition of empyema of Highmore's antrum. If a smooth piece of wood, as long as one finger's length, be so placed upon the hard palate that the anterior end rests upon the second molar, percussion will elicit a clear tone, if Highmore's antrum is empty (*i. e.* filled with air), and a dull one if it contains a fluid or a solid body.

68. McBRIDE attacks the still more prevailing view, that in chronic purulent accumulations in Highmore's antrum besides pain there is also a swelling of the fossa canina present. McBride is convinced that most if not all such affections are due to carious teeth, and relates two cases treated by himself. His treatment is the usual one : he extracts the second bicuspid or the first molar tooth, and passes a trocar-like instrument through the alveola into Highmore's antrum, which is then injected with disinfectant fluids, solutions of borax, etc.

69. BLOCH discusses the different views upon the anatomical significance of the bursa pharyngea, and believes it to be indisputable, "that the bursa pharyngea, which frequently occurs in adults, is found to be in the foetus in its first rudiment a firm union of the mucous membrane to the corresponding point of the pharyngeal roof." Gradually a median fissure or cavity develops, which is to be designated as a bursa pharyngea. Bloch does not grant that the bursa is a pathological formation. The affections of the bursa are then described according to Tornwaldt. With regard to treatment two indications should be fulfilled, viz.: the removal of the secretions, which Bloch effects with a special forceps, with syringe and spray apparatus ; and the direct treatment of the bursa with injections by means of a suitably

curved canula, with cauterizations by means of the probe (argent. nitr.) or with the galvano-cautery. The author has found the complete splitting of the bursa the best measure.

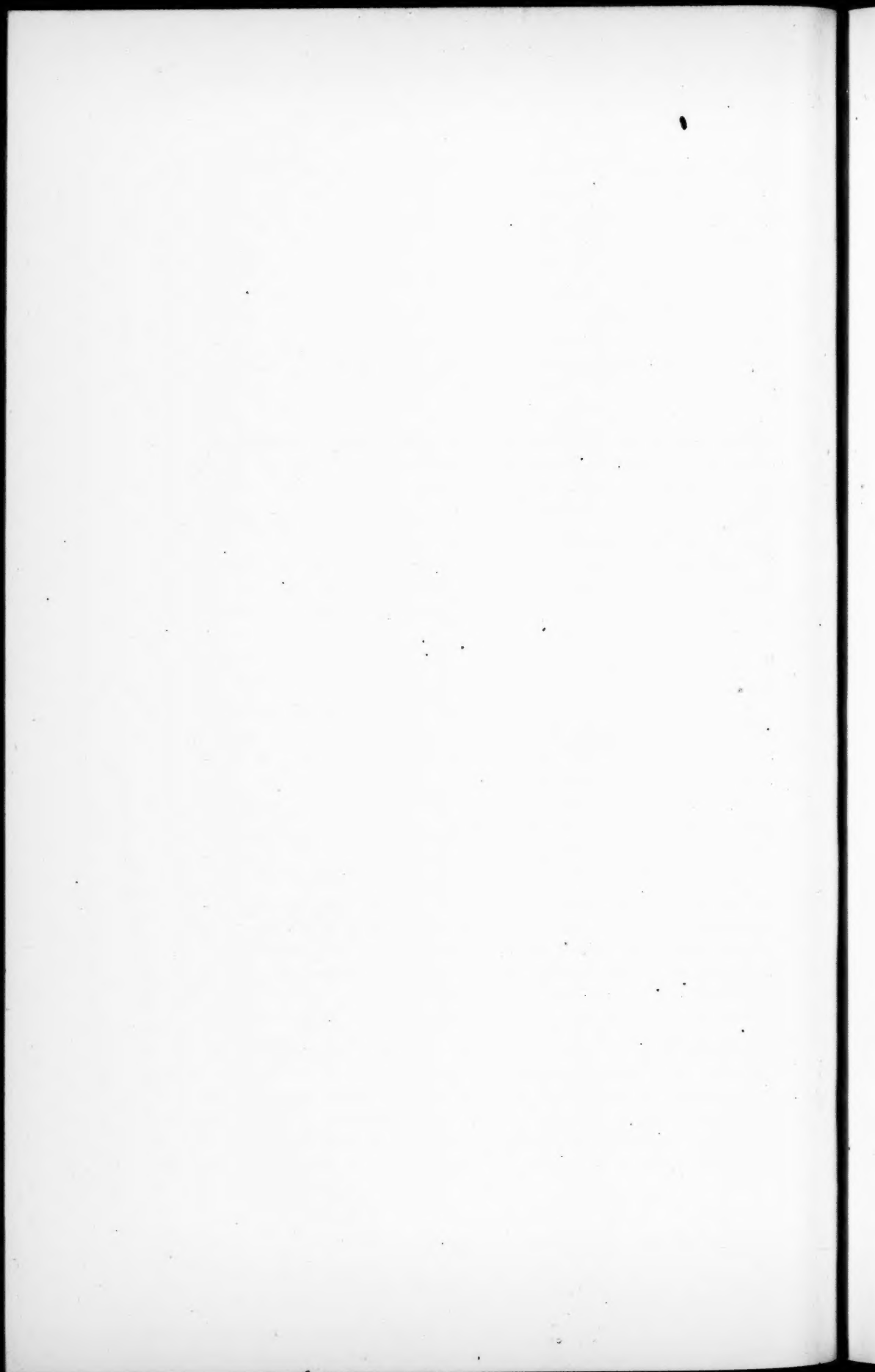
70. BLAKE does not pretend to offer any thing new ; he only points to the aural diseases so frequently associated with adenoid vegetations, whose etiology is frequently not recognized. The mode of development of difficulty of hearing by means of the vegetations in the naso-pharynx receives thorough discussion.

71. According to the seat of the root of the tumor, the nasal dorsum is incised with the scissors to the left or the right of the septum, the bleeding stopped, and the width of the affected nostril examined with the finger. The tumors are removed with a large and strong but not very sharp spoon. This should be wide enough to fill the nasal canal in its entire width. The spoon is introduced into the fossa with its concavity upward, then pressing it with the index finger of the other hand, introduced into the pharynx against the tumor, the latter is removed entire or piecemeal. The repeated introduction of the instrument is sometimes necessary. Although KÖNIG recommends this method for the removal of mucous polypi from the posterior parts of the nose, we must emphasize, that this can be done in a much easier and less disturbing manner by the usual method.

72. WEIL reports that he treats chronic pharyngitis with pure acetum pyrolignosum, with satisfactory result. The applications are made twice a week, producing at the beginning a strong burning sensation and an unpleasant taste.

73. FREUDENTHAL connects the development of abdominal herniæ with chronic obstructions of the nose and the naso-pharynx. There is no doubt that herniæ may develop in consequence of increased intra-abdominal pressure. According to the author there is no other disease which so frequently and constantly increases intra-abdominal pressure, as chronic obstructions of the nose and naso-pharynx. Freudenthal attempts to prove statistically the connection between these two diseases.





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